Petroleum review

APRIL 2000

Internet
E-business – dramatically reducing costs

Road tankers
- Going the extra mile
- Manufacturing for the millennium

Middle East
Iran targets foreign investment

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

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Training Courses

Aviation Jet Fuel

DERA

organised in association with DERA

12–14 April 2000 (3 days) The Institute of Petroleum, London

This new 3-day course is designed to provide a technical overview and to introduce delegates to the many facets of the Aviation Jet Fuel business – a business which operates at a truly global level. It will not only examine the workings of the modern jet engine, but will build the picture as to why, unlike some fuels, jet fuel specification, production and handling is critical to the continuing success of the aviation industry. It explores components of the business from several key perspectives, including oil company fuel suppliers and civilian and military users.

Speakers include: John Tiltson – Air Systems, DERA; Peter David/David Smelgrove, BP Amoco; Andy Clifford, Esso; Paula Carberry, DERA FLC

Course includes:

● Jet engine – how it works – why fuel parameters are critical ● Production of fuel – sources (current and possible future) ● Storage and distribution – filtration – outline the systems in use – problems such as: static, drag ● Oil company perspective – examples of refinery to wing – problems to overcome ● Microbiological contamination

Fundamentals of Petroleum Refining Processes (FORP)

organised in association with ENSPM Formation Industrie and the Institut Français du Pétrole

ensprm ifp

16–18 May 2000 (now 3 days) The Institute of Petroleum, London**

The course will cover: ● Petroleum products ● Refining processes ● Crude oil fractionation ● Catalytic reforming and isomerization ● Hydrorefining processes ● Conversion units ● Manufacturing schemes

Course objectives

Course participants will know and understand: ● The composition, main characteristics and new trends of petroleum products ● The roles of the different refining units and their process characteristics ● The main manufacturing schemes encountered in the oil refining field ● The economic context of this industry

Who should attend?

Anyone working in the oil and gas and related sectors whose activity, whether technical, commercial, legal, financial, or human resources, is in some way connected with oil refining.

**** New 3-day Registration Fee: IP Member: £1,300 +VAT Non-Member: £1,500 +VAT**

Trading Oil on the International Markets (ITO)

INVINCIBLE

organised in association with Invincible Energy

15–19 May 2000 Møller Centre, Cambridge

Delegates will become part of Invincible's fictional trading team, taking decisions about the company's activities to maximise profits through an understanding of the economics of trading and the management of inherent price risks.

Delegates 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, transportation, 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

Registration Fee: IP Member: £2,450 +VAT Non-Member: £2,650 +VAT

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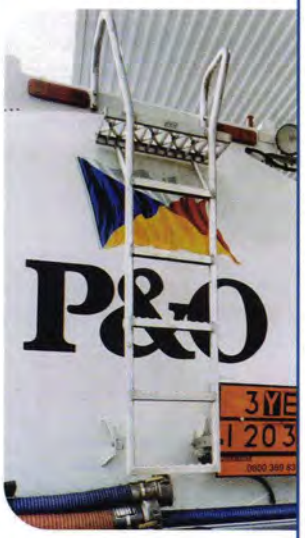
ABBREVIATIONS

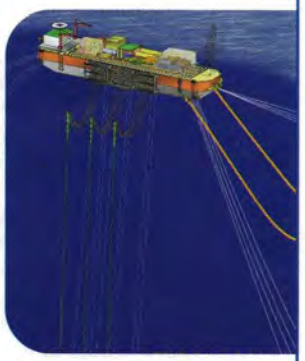
The following are used throughout *Petroleum Review*:

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

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

Front cover: Road tanker manufacturers are moving to all-aluminium construction. © Stephen Woodd Corporate Photography





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ROUNDUP From the Editor

Opec and Internet bring back the excitement

For the first time in many years there is a real buzz around the oil industry. Excitement, as always, is tinged with fear and uncertainty – the causes being Opec's, so far, undeclared production policies and the gathering momentum of the Internet revolution.

By the time *Petroleum Review* is published, Opec will have decided by how much it intends to expand production. The concensus for some time has been that Opec will open the taps. By how much and how quickly will determine whether prices ease back or fall back. It will also give the first clues as to whether current low stocks can be rebuilt by the autumn.

In an important sense Opec has seized the initiative. For the first time in many years what Opec does is determining oil and energy prices, and the degree to which the western world worries about energy supply. As we show on p16, Opec notionally has considerable unused capacity, although the capacity it can turn on straight away appears to be rather smaller than is generally believed.

Over the last few weeks, both the International Energy Agency (IEA) and Salomon Smith Barney's researchers have revised down estimates of Opec's sustainable production capacity. Salomon Smith Barney has reduced its estimates from 33,010mn b/d to 30,720mn b/d, a decline of 2,290mn b/d. The IEA has revised its estimate down to 32,100mn b/d, largely based on a 450,000 b/d capacity decline in Venezuela. The principal differences, in thousand b/d, between the two estimates are (IEA numbers first), Saudi Arabia 10,800 vs 10,000; Kuwait 2,700 vs 2,300; Algeria 1,000 vs 850; Indonesia 1,400 vs 1,300 and UAE 2,500 vs 2,400.

The volumes of non-Opec capacity due to come onstream this year are subject to wide variations. IEA has become increasingly optimistic, revising its estimate of new capacity upwards virtually every month to reach its current (February oil market report) estimate of 1.02mn b/d.

In stark contrast, the latest estimate (28 February) from Salomon Smith Barney suggests that non-Opec supply will increase by just 280,000 b/d in 2000. The difference is not academic. It is the difference between a comfortably supplied market and a tight one. The difference between price gains and price declines. The excitement is back.

The world of Internet enablement and e-commerce is now proceeding at such a pace in the oil and gas industry that is becoming very hard to keep up with the latest ideas and offerings. Ideas that appeared just months ago are now being implemented.

In an announcement that portends one of the largest trading websites in the world, a group of financial institutions, energy companies and natural resource firms have just launched IntercontinentalExchange. It is claimed that the new Internet-based electronic marketplace will reshape the trading of over-the-counter (OTC) energy, metal and other commodity products.

As the seven founding firms are BP Amoco, Deutsche Bank, Goldman Sachs, Morgan Stanley Dean Witter, Royal Dutch/Shell Group, Société Général and the TotalFina Elf Group, success seems assured – particularly as the seven have committed to a minimum annual participation in the markets of IntercontinentalExchange to ensure an adequate liquidity. OTC commodity markets are estimated to have been worth $1.8bn in 1999.

Chris Moorhouse, the IP's President and CEO of BP's trading arm, notes: 'This is an innovative commitment by significant market players to a progressive independent exchange that will enhance the transparency and liquidity in the market.'

IntercontinentalExchange will be based in Atlanta and headed by Jeffrey Sprecher, previously President and CEO of Continental Power Exchange. Participation will be open to all commercial market participants with trade in petroleum and precious metals starting later this year. Natural gas, power and base metals will follow later.

In addition to extensive coverage in *Petroleum Review*, we have now built a major 'e-commerce in the oil and gas industry' area into the Institute of Petroleum website at **www.petroleum.co.uk** This contains articles, projections, links, latest status report and also full details of the IP's e-commerce conference entitled 'Digital Black Gold' on 11 April.

Our aim is to provide a single comprehensive reference point for news and knowledge about the Internet enablement of the oil and gas industry. Any comments, additional information or corrections would be gratefully received.

Chris Skrebowski

Web World

The number of industry related websites continues to increase, providing an ever broader range of information at the click of a mouse. Sites well worth a visit include the World Refining Association's site at **www.theenergyexchange.co.uk** and **www.tmtechnology.co.uk** – TM Technology's site which, in addition to details of tank gauging and remote stock monitoring systems, offers visitors a free copy of its Unicorn 2 conversion software. **www.pipeguild.co.uk** is the Pipeline Industries Guild site, while the ASTM Standardization News magazine is now online at **www.astm.org**

Editions Technip's website can be found at **www.editionstechnip.com** while the PINTO (Petroleum Industry National Training Organisation) website is accessed from **www.pinto.co.uk** At **www.cenelectrex.com** there are a range of static electricity control products which can be viewed and ordered to either European or North American standards.

E-business

The sector continues to develop rapidly. Recent news includes BP Amoco's announcement that it has chosen ChemConnect's 'World Chemical Exchange' – **ChemConnect.com** –as its preferred third-party platform for chemical trading. Sir John Browne has announced that the goal is to have all chemicals business trading online by end-year, along with 95% of procurement activities.

This summer will also see the start of spot electricity trading on the EEX (European Energy Exchange). This will be followed by electricity futures in the fourth quarter. Initially for the German market, the new exchange has 12 major regional utilities and 12 municipal electricity companies, in addition to industrial consumers, banks and financial services companies, and traders among its shareholders. Plans are to extend to Austria and the Netherlands, and ultimately to all of Europe.

The planned B2B trading platform **theoilsite.com** reports that its share offer, which closed on 7 March, was oversubscribed with the large subscribers getting only 60% of the shares required. Share dealing on OFEX is due to start by late March. The company was formed by a group of oil industry professionals – Dr Peter Felter is the Chairman, Lord Fraser of Carmyllie the Deputy Chairman and Mike Doherty the CEO. The operational site is due to be launched in April.

(continued on inside back cover)

NEWS Upstream

Green light for In Salah development

BP Amoco and Algerian state company Sonatrach have been given the go-ahead to develop a $2.5bn complex of gas fields in the Sahara Desert in central Algeria. The seven In Salah fields are expected to supply some 9bn cm/y of gas to the fast-growing markets of southern Europe. First deliveries are due in 2003. Some 4bn cm/y of gas have already been assigned to Enel in Italy and negotiations are reported to be 'at an advanced stage' to sell the balance into the Spanish and Italian markets.

Field reserves are put at more than 7.5tn cf of high-quality gas. Additional volumes have been identified in adjacent reservoirs.

In Salah is BP Amoco's second major project with Sonatrach in Algeria. Preparation work is also underway on the In Amenas development based on four gas and condensate fields in the east of the country. The project is expected to produce 20mn cm/d of gas and 45,000 b/d of condensate and LPG. First production is due in 2H2002.

North Sea pipe-in-pipe first for CSOL

Coflexip Stena Offshore Ltd's (CSOL) reel-to-reel pipe system has been used for the first time in the North Sea on Enterprise Oil's Cook field in block 21/20a. The piping system has already been successfully applied in Australia (Esso's Blackback and Bass Straits projects) and Norway (Statoil's Gullfaks field).

The *CSO Apache* – claimed to be the most advanced rigid pipelay vessel currently operating in the offshore industry – installed a 12-km 'pipe-in-pipe' production flowline from the Cook field to the Shell-operated *Anasuria* FPSO, together with a 3-inch diameter utility flowline piggybacked to the 12-inch production line. It has also installed a 9.2-km control umbilical linking Cook to the existing Teal manifold. Pipelay was slightly delayed due to weather, however, CSOL reports that the schedule remained within its contingency period and completed in early March.

CSOL's Evanton spoolbase in Scotland manufactured the Cook pipe-in-pipe production flowline, which consists of an 8-inch pipe within a 12-inch pipe, with insulation material applied within the annulus. Cook is a high temperature/high pressure field. Product will leave the wellhead at 139°C, where it will enter a manifold cooling loop so as to reduce the temperature to 120°C before it enters the flowline. The cooling loop is expected to be bypassed at around year three of the 20mn barrel field's four to five-year life once the wellhead temperature has declined.

CSOL has tendered bids for a number of North Sea projects, including BG's Blake field, Maersk's Kyle, TotalFina's Nuggets and Otter, and Shell's Kestrel.

The company is also looking to become more involved the decommissioning market and has written and undertaken much of the preparatory work for a 60-day abandonment programme on Philips Maureen field next year. The project had been due to be abandoned this year, but was postponed due to extended production.

In Brief

United Kingdom

The UK Court of Appeal has reduced *the fine levied against Milford Haven Port Authority following the Sea Empress oil pollution disaster in 1996 from £4mn to £750,000.*

***R&B Falcon Corporation's* Jack Bates** *semisubmersible has been awarded three one-well drilling contracts, each with a separate operator. The wells are to be drilled sequentially to the west of Shetland. The seven-month programme is due to begin in 2Q2000 and has been valued at $29.7mn.*

Talisman Energy is reported to be *expecting to announce up to 140 redundancies after it takes control from Elf Exploration of the Piper, Saltire and Claymore platforms in the North Sea and the Flotta oil terminal in Orkney.*

The UK Lift initiative, launched by the *UK's Oil and Gas Industry Task Force in November 1999, has entered the global arena after being adopted by the new worldwide asset trading E&P website* **www.Indigopool.com**

The Faroes Oil and Gas Company *has formed an alliance with Sagex Petroleum in order to secure a stake in Faroese acreage released in the first offshore licensing round on 17 February 2000.*

Europe

Norsk Hydro is understood to be planning *to sell or trade stakes in 23 of its 107 oil licences on the Norwegian continental shelf.*

Production from Amerada Hess' South *Arne field in the Danish sector of the North Sea has reached planned platform capacity of 50,000 b/d of oil and 70mn cf/d of gas.*

Statoil is understood to be selling a *10% stake in the Glitne oil field in the Norwegian sector of the North Sea to DNA for an undisclosed sum. Field reserves are put at 25mn barrels of recoverable oil. First production could be as early as 2001.*

Statoil is reported to have awarded *Saipem UK a contract to transport and install the jacket and topsides for the Kvitebjorn gas condensate field in the North Sea.*

NEWS Upstream

UK oil industry prospects rest on Opec meeting

This month's Vienna meeting of Opec and its allies is likely to result in a modest boost to output, reports the latest Royal Bank of Scotland *Oil and Gas Index*. The high price of crude oil is beginning to have an unwelcome and adverse impact on the world economy, in particular the US, states the report.

The Vienna meeting is also reported to be crucial to the UK oil industry's short and medium-term prospects. Stephen Boyle, the Head of Business Economics at the Royal Bank, said: 'One reason the industry in the UK has so far resisted significant new investment is because oil prices that are well in excess of $20/b are simply not sustainable. The restraints have been so successful that over the last few months there has been good reason for some producers to want to relax their adherence to the cuts. Thus, the incentives to renegotiate the cuts have been rising – most Opec members don't need oil at $27.'

Year Month	Oil production (av. b/d)	Gas production (av. mn cf/d)	Av. oil price ($/b)
Jan 1999	2,664,121	11,532	11.16
Feb	2,678,138	11,532	10.20
Mar	2,679,786	11,107	12.54
Apr	2,717,767	9,863	15.66
May	2,507,093	7,349	15.18
Jun	2,400,277	6,785	15.91
Jul	2,602,363	6,852	18.90
Aug	2,645,493	6,604	19.93
Sep	2,588,488	7,379	22.83
Oct	2,666,146	9,380	22.03
Nov	2,698,681	11,641	24.64
Dec	2,634,050	13,054	25.64
Jan 2000	2,645,841	13,105	25.63

Source: The Royal Bank of Scotland Oil and Gas Index

North Sea oil and gas production

Russian exploration reaches 'crisis'

The Russian Ministry of Fuel & Energy has noted that oil and gas exploration in Russia has reached crisis – and this after a year of record profitability in the sector, says the United Financial Group's *Russia Morning Comment*. The country produced 106mn tonnes more than it discovered in 1999 – 'rather putting the lid on claims that a new era had arrived with the Russian oil industry investing for its future', comments UFG. 'The reality is that most companies failed to replace their reserves during 1999 and are therefore slowly going out of business.'

According to UFG, the same is true of the gas industry, where output of 590bn cm was offset by discoveries of just 208bn cm.

Oil production is forecast to rise by more than 1% and gas production is expected to be stable at 590bn cm.

Banff export system to be upgraded

The 131,000 tonnes tanker *Nordic Apollo* is to be permanently moored on the Banff North Sea oil field, replacing the existing single anchor loading (SAL) system which has been prone to technical problems and has contributed to disappointing production figures for 1999. It is hoped that the double hulled FPSO, which is capable of storing in excess of 900,000 barrels of oil, will provide a more reliable export system for Banff crude and will reduce significantly the need for dedicated shuttle tankers which can be deployed elsewhere.

According to PGS Atlantic Power, owner and operator of the Banff production facilities, the *Nordic Apollo* will also make continuing production less dependent on the weather and the limited storage capacity of the *Ramform Banff* FPSO.

In Brief

***KCA Drilling is reported to have** secured a $5mn contract to refurbish Repsol's Casablanca platform offshore Spain. The company is to upgrade the platform and drill two initial wells.*

***Fortum plans to boost its Norwegian** continental shelf production to 50,000 boe/d by early 2001.*

***Aker Offshore Partner has secured a** NKr75mn contract from BP Amoco to upgrade the North Sea Ula platform to receive oil from the new Tambar satellite platform.*

***The Norwegian Government is** reported to be scrapping production fees in a bid to boost offshore production. The fees, which range between 8% and 16% of the value of oil produced, will be phased out. Fields developed after 1986 are generally exempt from the tax.*

***The latest figures for Statoil's North** Sea Asgard field are reported to have valued the project development at NKr65.7bn($8bn). Originally expected to cost just NKr47bn, the field has been subject to a number of cost overruns and technological problems associated with construction of the Asgard B floater. Despite delays, the field is understood to still be on schedule for an October 2000 start-up.*

***Kvaerner is understood to have** secured a $35mn contract for a wellhead platform on BP Amoco's Tambar field. The North Sea field is to be tied back to the Ula facility and is due onstream in 2001.*

***BJ Services has secured a contract for** the provision of coiled tubing and related engineering and pumping services on Phillips Petroleum Company Norway's offshore installations in the Greater Ekofisk region of the Norwegian sector of the North Sea.*

***Esso Norge is reported to have selected** ABB to supply three subsea production systems and two subsea water injection systems for the North Sea Ringhorne field.*

North America

***PetroCanada is understood to be** increasing its stake in the Terra Nova oil field project from 29% to 33.99% and its interest in White Rose from 17.5% to 27.5% under an exchange deal with Husky Oil. Under the deal,*

NEWS Upstream

North Sea fallow fields initiative unveiled

UK Minister for Energy, Helen Liddell, has launched a fallow fields initiative in a bid to encourage new oil and gas development in UK waters. 'The time is ripe for industry and government to work together in examining the prospects for fallow acreage,' said said. Can any blocks be freed up for new work? Will additional drilling work release new resources? Can licences be sold to companies with neighbouring infrastructure?' she asked.

She stated that it made no sense for companies to hold on to acreage for which they have no plans. 'There could be others who are prepared to explore and develop those blocks. This initiative goes hand in hand with the Task Force work on new licensing, LIFT and DEAL; they are all aimed at putting licences in the hands of those prepared to invest in them.'

Fallow blocks are those blocks that have entered their second terms but have seen no drilling activity for six years or more. Fallow discoveries are those that have awaited development for six years or more. According to the Department of Trade and Industry, there are currently some 200 offshore fallow blocks and 150 undeveloped discoveries.

Strategic oil stock deal

UK Energy Minister Helen Liddell and her Swedish counterpart, Lars Rekke, have signed an agreement under which oil companies in each country will be able to pool the oil stocks they must keep in reserve.

EC law requires member states to hold contingency oil stocks which are equivalent to 90 days of their average national daily consumption in the preceding year, in order to protect from any possible disruption to international supplies. The Directive allows a member state to reduce its oil stocking obligation by up to 25%, depending on the state of its indigenous oil supplies. Because the UK is currently self-sufficient in oil supplies, it gets the full benefit of the 25% derogation and is therefore only required to hold around 70 days worth of stocks.

This new agreement will allow UK and Swedish companies to cooperate in meeting these obligations, substantially reducing costs in the process.

St Fergus expansion plans

Parsons Energy & Chemicals has secured a contract from Shell Expro to develop preliminary plans for new inlet, receiving and separation facilities at the St Fergus gas terminal in northeast Scotland. The contract will progress studies for a possible development of gas condensate from the South Halibut area of the Outer Moray Firth. The area includes Goldeneye and several other gas discoveries. Last year the South Halibut Basin area was the subject of an infrastructure study conducted jointly by several operators which looked at ways of reducing costs, but planning is still at an early stage.

Earliest production is not foreseen before end-2003. One option being considered is to send unprocessed liquids from Goldeneye to St Fergus through a new pipeline, and process these at new inlet facilities at the terminal. It is this option which is now being more closely evaluated.

Innovative deal to boost Ima field production

Shell and Baker Hughes have raised a $19.1mn loan with Amni International Petroleum Development Company of Nigeria to redevelop and increase production from the Ima field in the shallow waters offshore Nigeria. Two additional development wells are to be drilled on the field, together with two sidetrack wells alongside wells that have suffered bore damage. It is claimed that the project could boost field production by between 6,000 and 8,000 b/d of condensate – double the current output. A total of 10 wells have been drilled to date, and 11mn barrels produced. Field reserves are put at between 15mn and 30mn barrels.

Shell Trading International and Baker Hughes have agreed a Condensate Sale and Purchase Agreement, the latter to carry out the subsurface field development work. The arrangements, together with an oil price hedge, will create an innovative structure that is beneficial for all parties involved, states Shell. The deal was completed in just 90 days. According to Tunde Afolabi of Amni, 'arranging a similar deal through traditional lenders, who don't have the same understanding of the assets involved, would typically have taken around five months.'

David Adams of Baker Hughes said: 'The deal provides a new model in the West African marketplace and could be used as a model to unlock potential oil and gas production in other parts of the continent. It enables each party to extract the maximum value from their expertise and contribution to the further development of the Ima field.'

In Brief

Husky will acquire all of PetroCanada's interests in the Valhalla and Wapiti western Canadian conventional oil properties. Husky will retain a 12.51% stake in Terra Nova and 72.5% in White Rose, which it operates.

***Kerr-McGee's Board of Directors is** reported to have approved the development of the Boomvang and Nansen fields in the Gulf of Mexico. Following partner approvals, plans are to develop the fields via two separate spars linked to oil and gas export pipelines. The Boomvang spar is to be designed for the production of 30,000 b/d of oil and 200,000mn cf/d of gas, while Nansen will be designed to handle 40,000 b/d of oil and 200,000mn cf/d of gas.*

***Rowan's* Gorilla III *and* Gorilla V** *drilling rigs are understood to have secured a 12-month contract from PanCanadian Petroleum. The contract, valued at $41mn, is reported to include the abandonment of the Cohasset and Panuke fields near Sable Island and exploratory drilling.*

***Apache has announced a Canadian gas** discovery in British Columbia. The well in the Ladyfern area tested at 31mn cf/d.*

***The Canada-Newfoundland Offshore** Petroleum Board is reported to have approved plans to raise production from the Hibernia field by 20% to 180,000 b/d. It also approved a further increase to 200,000 b/d once equipment modifications on the offshore rig are completed in March.*

Middle East

***Elf and Agip are reported to have** received approval to develop the eastern area of the Alkhalij field on block 6 offshore Qatar, boosting production from 30,000 b/d to 60,000 b/d of oil. First oil from the new facilities is due in 3Q2001.*

Russia & Central Asia

***Shell and Turkmengaz are reported to** be setting up a joint venture that will sign a production sharing agreement with the Turkmen Government on the fields that will supply gas for export via the TransCaspian pipeline. Shell and PSG of the US are acting as operators of the pipeline project.*

***Gazprom has said that it expects to** reduce output by 25bn cm during 2000, a fall in output of some 4.6%.*

NEWS Upstream

Shearwater on time and under budget

The high pressure/high temperature Shearwater project in the North Sea – discovered in 1991 – is reported to be running on time and about 10% under its £876mn budget. Savings in the region of £40mn were made in the drilling of five production wells by Maersk, which were completed 350 days ahead of schedule. The speed of the programme also enabled a sixth well to be drilled in the poorer quality Pentland sands which, at 15,500–17,000 ft subsea, underlie the main producing reservoir where hydrocarbons are trapped in Jurassic Fulmar Sandstone in a rotated fault block.

Recoverable reserves are put at 844bn cf of gas and 159mn barrels of condensate and liquids. Additional reserves are contained not only within the underlying Pentland Sands, but also in an adjacent salt related trap.

The field lies beneath 295 ft of water. Development has presented considerable challenges to the operator as it contains 30 ppm hydrogen sulfide and has a reservoir pressure of 15,000 psi and temperature of 185°C. The overpressured reservoir has made it necessary for all of the development wells to be drilled prior to production.

The 11,600-tonne Shearwater deck – claimed to be the heaviest integrated deck built to date for UKCS operations – was loaded onto a barge at Amec's Wallsend fabrication yard on the Tyne on 28 February 2000. Having completed fabrication for this project, the yard is currently scheduled to go onto a care and maintenance programme.

Sailaway for block 22/30b in the Central North Sea was scheduled for 9 March. The lift, claimed to be the heaviest undertaken to date in the North Sea, was performed by Heerema's *Thialf* heavy lift crane barge. Hook up is scheduled to take 85 days, with first production planned in July 2000.

The field facilities have been designed to handle a production rate of 410mn cf/d of gas and 90,000 b/d of condensate and liquids. Planned field life is 12 years, with production expected to come off plateau in 2003. However, it is anticipated that the facilities will ultimately have a production life nearer 30 years as an export route for smaller satellite accumulations in the area.

Shell claims that the Shearwater platform is the safest and most environmentally friendly installed in UK waters to date. The pre-floatout safety record is good – said to be eight times better than on previous projects. Significant environmental discharge objectives were also built into the platform's design, including reduced flaring, less use of fuel gas as a result of improved thermal efficiency, offshore processing of sulfides into more environmentally friendly sulfates, total containment of all oil based muds, recycling of drill cuttings, and processes designed for minimum overboard discharge.

Shearwater partners are: ExxonMobil (44.5%), Shell UK (operator, 28%) and Arco British (27.5%). The offshore facilities were fabricated by an alliance of Shell Expro, Amec Process and Energy, and Heerema.

In Brief

Conoco is understood to be taking a *20% stake in the Zafar/Mashal development project in the Azeri sector of the Capsian Sea. Reserves are estimated to be 400mn toe.*

Shell is acquiring the respective 12.5% *interests of Monument Resources (Caspian) and Central Fuel Caspian Sea in the Inam licence, offshore Azerbaijan, for $36mn. Partners in the Inam concession now comprise: Socar 50%, BP Amoco (operator) 25% and Shell 25%. The first well on the concession is due to be spudded in 3Q2000.*

Russian oil companies increased *drilling volumes by 16% in 2H1999. Lukoil increased its drilling operations by 5%, Surgut increased by 8% and Sibneft by 43%. Tatneft, however, drilled 16% less in the 2H1999.*

Itera, a company believed to be closely *affiliated with Gazprom management, has announced a 2000 gas production target of 20bn cm, reports the United Financial Group's* Russia Morning Comment. *This would represent an increase of 144% over the 1999 level.*

Gazprom is to take part in the Kovykta *gas project, according to the United Financial Group's Russia Morning Comment. The BP-operated Kovykta field has had its reserves upgraded by 29% to 1.12tn cm of gas.'To put this into perspective, this is almost 50% larger that the UK's total gas reserves', comments UFG. An additional area adjacent to Rusia Petroleum's block contains a further 286bn cm of gas and is being bid for by Gazprom.*

Gazprom is reported to be joining *forces with unnamed foreign investors to develop the Shtokman gas field in the Baring Sea. The field, which has reserves put at 3tn cm, is not due onstream until 2008.*

In January–February 2000 Russian *crude oil production rose by 5% over January–February 1999, reports the United Financial Group's* Russia Morning Comment.

Asia-Pacific

Technip Malaysia has been awarded a *$500mn contract by Carigali-Triton, as part of a Technip-led consortium with Samsung and Saipem, for the Cakerawala gas project in the Malaysia–Thailand Joint Development Area.*

NEWS Upstream

Dolphin initiative signs up Elf and Enron

Enron and Elf are to take 24.5% equity shares in the United Arab Emirates Offsets Group's (UOG) Dolphin gas initiative which is designed to stimulate industrial and business investment in the UAE and beyond through the development of an extensive gas supply and infrastructure system in the Gulf region. The initial goal of the project is to deliver up to 3bn cf/d of Qatari gas to the domestic, Abu Dhabi, Dubai and Oman markets via a new pipeline network by 2002.

The project will focus on development activity along the entire gas value chain – upstream, mid-stream and, later, downstream – and will ultimately include multiple partnerships and industrial facilities in all of the countries. All partners will be involved in all phases of the project. However, Elf will focus primarily on upstream development, while Enron will focus on pipeline development, gas marketing and project risk management.

It is understood that, where deemed desirable, facilities will be project financed without recourse to the partners or government subsidies, and that other third parties will be added as equity partners in Dolphin's downstream industrial ventures as they are created along the pipeline route.

Deir Ez Zor gas project contracts

Kvaerner has secured a $160mn contract from Conoco and Elf Aquitaine for the integrated Deir Ez Zor gas project in Syria's eastern desert. The project involves the construction of two natural gas processing plants with a combined capacity of 450mn cf/d of gas, six compressor stations, a 100-mile gathering system, and a 155-mile export pipeline. Kvaerner is to undertake all major elements of the infrastructure associated with the project, including engineering, procurement and construction.

The project will gather associated gas and production that has historically been flared in oil fields in the Deir Ez Zor region. Demand for natural gas in Syria far exceeds the country's current supply. The new pipeline will carry 150mn cf/d of processed gas to an existing delivery system running to the major population centres in Western Syria, including the capital Damascus.

Shell and PetroChina assess Changei prospects

PetroChina, a wholly owned affiliate of China National Petroleum Corporation (CNPC), and Shell Exploration China have signed a letter of intent to jointly study prospects for gas transmission and market development for the Changbei gas field in the Ordos Basin in the Shaanxi and Inner Mongolia provinces of central China. It is hoped to market Changbei gas to Beijing, Tianjin, Hebei, Shandong and other east China provinces.

The companies have already identified a strong market demand and a joint pre-feasibility study for the pipeline routing is starting, which will incorporate the results of further gas marketing activities.

The Changbei project is Shell's first onshore upstream development in China and is the largest undertaken by PetroChina in the country in partnership with a foreign investor. It is expected to deliver up to 3bn cm/y of gas over 20 years. Production could begin by 2004. Full realisation of the project, including gas development, pipeline construction and associated power generation will need a total investment of $3bn, comments Shell. Some $27mn will initially be spent on the evaluation phase to establish commercial viability.

Guarantee for Blue Stream project

Italian export credit agency SACE has issued a $1bn guarantee for Gazprom's Blue Stream project, reports the United Financial Group's *Russia Morning Comment*. The funding will be provided by a consortium of Italian and German banks and will cover construction costs for the offshore portion of the 16bn cm/y gas pipeline to Turkey.

'Gazprom's contractor, Saipem/Eni, has already started laying pipeline on the bottom of the Black Sea, which is a sign of the company's confidence that it will secure the necessary financing' for the project,' comments UFG. 'Nevertheless, the actual issuance of the guarantees is an important milestone in the project and it increases Gazprom's chances to start gas deliveries to Turkey by end-2001.'

In a related story, UFG reports that Turkmenistan has raised the price of gas in its negotiations with Gazprom to a level which may not be acceptable for the Russian company. Turkmenistan now wants $42/mn cm, $6mn cm more than Gazprom was prepared to pay.

In Brief

UK independent Lasmo is close to *finalising a gas pricing agreement with the Pakistani Government which would pave the way for developing the company's Bhit and Bhadra gas fields located in Sind province, reports* Stella Zenkovich. *The two fields, together with the Zamazama field located some 50 km from Bhit, have combined reserves of 1.5tn cf of gas.*

Premier Oil's Naga-1 exploration well in *Natuna Sea block A offshore Indonesia has proven substantial gas columns in eight separate reservoir sands in the Arang formation close to the Pelikan and Gajah Puteri discoveries.*

The Korea National Oil Corporation is *reported to have stated its intention to bring the 200bn cf Gorae-V offshore gas field onstream by June 2002.*

Latin America

Statoil is reported to be planning to *invest up to $250mn in the Venezuelan extra-heavy crude oil joint venture Sincor this year and $50mn in the marginal LL652 oil field, which it currently operates.*

Cuba is reported to have formally *invited foreign investors to participate in deepwater exploration projects in Cuba's Exclusive Economic Zone in the Gulf of Mexico.*

Mexican state oil company Pemex is *understood to be planning to add two more platforms, at a cost of $100mn, to the Cantarell offshore oil field.*

Africa

The closing date of the Republic of *Cameroon third licensing round has been extended to 30 June 2000.*

Shell Nigeria is reported to be planning *to double oil production to 1.5mn b/d of over three years.*

Apache reports that its Neith South 1X *well on the Khalda Offset Concession in Egypt's Western Desert has tested at 2,778 b/d of oil and 4.5mn cf/d of gas, and that its Akik-1X well on its West Mediterranean concession in Egypt has tested at 23.4mn cf of gas and 1,685 b/d of condensate. Its Karama-1X well on the East Bahariya Concession in Egypt flowed 1,520mn b/d of oil and 500,000 cf/d of gas.*

NEWS Upstream/Industry

Phillips acquires Arco's Alaskan assets

BP Amoco and Arco have agreed to sell Arco's Alaskan businesses to Phillips Petroleum for $7bn. The deal is subject to completion of the Arco merger and it is intended to address the anti-trust concerns of the US Federal Trade Commission (FTC). BP Amoco is currently in negotiation with FTC to obtain a consent order for its proposed merger with Arco. BP Amoco and Arco have agreed jointly with the FTC, the US West coast states and Alaska to suspend litigation – originally scheduled to begin on 20 March – pending the outcome of these negotiations.

Arco's Alaskan assets include a 21.9% stake in the Prudhoe Bay oil rim and 42.6% of the gas cap, a 55% interest in the greater Kuparuk area and a 78% stake in the Alpine field. The package also includes 1.1mn net exploration areas, a 22.3% stake in the TransAlaska pipeline, and Arco's crude oil shipping fleet which includes six tankers in service and three under construction. The booked reserves being sold total 1.9bn boe.

Gulf of Mexico attracts $455mn of interest

The continuing vitality of the Gulf of Mexico was evident in the auction of offshore blocks in its Central Region which was held on 15 March 2000, writes *Judith Gurney*. Some 63 companies made a total of 469 bids for 344 of the 4,203 blocks offered. In the last auction for this region held in March 1999, only 272 bids were received for 205 blocks. The total amount offered this year was $455mn, compared to $200mn last year.

This year's bidders were interested in both shelf and deepwater blocks. Some 58% of the bids were for OCS blocks in water depths of less than 200 metres, while 33% went for blocks in depths greater than 800 metres – including one block in Walker Ridge with depths of 3,379 metres. The money, however – 71% of the total placed on the table – went for deepwater blocks. As is usual in Gulf of Mexico auctions, the middle ground received little interest, with eight blocks in water depths of 200 to 400 metres receiving $2.5mn in bids, and 18 blocks in water depths of 400 to 800 metres receiving $16.5mn in bids.

Exxon was a major presence, with a total of $61mn apparently successful high bids (the MMS (US Mining and Minerals Service) does not issue its final decision on bids for several weeks after an auction). It also made the highest single successful high bid of $23mn for a Mississippi Canyon deepwater block, competing for this prize with seven other bidders. The company with the second highest bid total was Anadarko, followed by Marathon, Vastar, Shell, CNG Producing, Unocal, Murphy, Kerr-McGee, Samedan and Chevron. Anadarko won all but one of the 34 blocks it bid for and Kerr-McGee was successful in all of its bids. By contrast, Conoco failed to win any of the four blocks for which it bid a total of $20mn, an honour it shared with tiny Ridgelake Energy which failed to win the block for which it offered $115,000. BP Amoco, Texaco and Amerada Hess bid modestly and were relatively successful.

Although these results pale when compared to those of 1998, when $1.4bn was bid in a Central Gulf auction for 794 blocks, the comparison does not indicate a gradual decline of interest in the Gulf. Most offshore blocks are currently leased, and many companies focus on tending to what they own, viewing new auctions mainly as a way of filling up the edges of leased areas which they deem to have good potential.

BP and Shell divest Altura interests

BP Amoco and Shell are to sell all of the common interest in their Altura Energy exploration and production partnership to Occidental Petroleum in a deal valued at $3.6bn (after certain adjustments). Production by Altura in 1999 averaged about 150,000 boe daily. According to BP Amoco, whose 64% interest in Altura represents approximately 96,000 boe production daily, this deal will allow the company to 'focus on our core growth in areas such as gas and the deep water Gulf of Mexico'. Shell's 36% stake in Altura represents approximately 54,000 boe daily. The company states that the 'divestment is an integral part of our ongoing programme of portfolio restructuring and upgrades'.

Some 85% of Altura's production is in a single geographic area. Its 10 largest fields – which include Wasson, Yates, Slaughter, Levelland, North Cowden, Cedar Lake, Fullerton, Headlee and Hobbs, account for approximately 65% of the company's total production. Altura is the largest oil producer in Texas.

In Brief

United Kingdom

***Inventories of greenhouse gas emissions** from England, Scotland, Wales and Northern Ireland have been separated from the UK total in order to enable each country to develop policies to secure reductions. The UK is committed under the Kyoto Protocol to reduce emissions of greenhouse gases by 12.5% below 1990 levels by 2008–2012.*

***A total of 96% of members of the** London-based International Petroleum Exchange (IPE) are reported to have voted in favour of demutualising the IPE into a for-profits company.*

Europe

***Former Energy Minister Jens** Stoltenberg is reported to have become Norway's new Prime Minister. Olav Akselsen is the new Minister of Petroleum and Energy, succeeding Marit Arnstad.*

***Edinburgh-based consultancy Wood** Mackenzie has 'welcomed' the positive recognition given to emissions trading in the European Commission Green Paper on greenhouse gas trading published on 8 March, but warns that parallel EU efforts restricting international emissions trading may significantly increase the compliance costs for the major greenhouse gas emitting countries which include Sweden, Belgium and the Netherlands, as well as Norway and Japan. The company estimates that the additional cost burden in the three EU countries may exceed $1bn.*

North America

***BP Amoco and Arco are selling the** latter's interests in the Cushing storage terminal, together with various pipeline interests, to TEPPCO Partners of Houston for $355mn. It is hoped the sale, which follows the sale of Arco's Alaskan assets to Phillips Petroleum, will help progress negotiations with the US Federal Trade Commission which is currently blocking the proposed merger of BP Amoco and Arco.*

***BP Amoco has announced that, sub**ject to its Arco merger going ahead, it plans to acquire the minority stockholding of Vastar Resources at $71 per share. Arco already holds some 82% of Vastar, one of the largest independent oil and gas producers in the US.*

NEWS Industry

Chechnya bypass pipeline project completes

Transneft will complete the construction of the 170-km Chechnya bypass pipeline by the end of March, reports the United Financial Group's *Russia Morning Comment.* The pipeline will restore the transportation route between Azerbaijan and the Russian port of Novorossisk, benefiting Lukoil's long-term interest in Azerbaijan. However, being a stand-alone investment, it has rather dubious prospects, since Azerbaijan still has not allocated sufficient oil volumes and Transneft can only hope that Kazakhstan and Turkmenistan will pump their crude through the pipeline, comments UFG

The $85mn cost of the project will be distributed among the oil companies by applying a 12.3% mark-up to the current oil export tariff ($0.06/b), which will become effective on 1 April 1999.

Fortum unveils new Climate Initiative

Energy group Fortum has proposed a voluntary programme – the Climate Initiative – in an attempt to reduce carbon dioxide (CO_2) emissions caused by energy production and use both in Finland and abroad. The group's strategy is based on increasing the use of both renewable and low-carbon raw materials and on the Climate Fund that it has established. The Fund will participate in projects outside Finland that, by means of new technology and new ways of thinking, enable reductions in emissions from energy production.

Fortum expects to reduce its CO_2 emissions in Finland by between 300,000 and 500,000 t/y by 2005, primarily by increasing the use of biofuels. The group produced 9mn tonnes of CO_2 emissions in Finland 1999. The country currently produces about 70mn tonnes of greenhouse gases.

Standard & Poor's lowers Statoil credit rating

Following a weakening in the business profile of Norway-based oil and gas company Statoil, Standard & Poor's has lowered its long-term corporate credit and senior unsecured ratings on the company to double 'A'-minus from double 'A'. At the same time, Standard & Poor's affirmed its 'A-1'-plus short-term corporate credit, commercial paper, and short-term debt ratings on Statoil. The outlook is reported as negative.

'The rating action is primarily in a response to a weakening in the business profile resulting from a 30% decline in proven reserves,' comments Standard & Poor's. 'This follows a restatement of the reserve base according to the US SEC standards. Consequently, Statoil's proved reserve base now totals 31bn boe, and its reserve life is lowered by six years to 14 years. The restatement was, among other things, related to natural gas reserves that are geologically present but cannot be classified as proven because they lack offtake contracts. It is estimated that Statoil's finding and development costs have averaged approximately $7.50/boe over the past three years, which is substantially inferior to similarly rated peers.'

EC proposes emissions trading system

The European Commission has released a consultation document on introducing an emissions trading system with the European Union by 2005, ahead of an anticipated move to an international system by 2008 under the Kyoto Protocol, writes *Keith Nuthall.* A Green Paper proposes that the European system should initially focus on carbon dioxide as 'the most easily and accurately monitored of the greenhouse gases'.

The move follows agreement on the establishment of an EU monitoring scheme for carbon dioxide emissions from new cars, which could underpin such a trading system. The scheme will monitor the EU's strategy to cut such pollution, with data being collected on new car emissions, their manufacturer, fuel type, mass, engine power and engine capacity.

As for the Green Paper, it suggests that large industrial plants are 'most suited to start emissions trading', but the Commission is still inviting comments before 15 September 2000 on 'which sectors should be included initially'. Other questions include how far Member States' systems differ, how should allocations be made to companies, and how should such a system be policed?

Visit the IP News in Brief pages @ www.petroleum.co.uk

In Brief

PetroCanada is selling three of its *Pembina, Boundary Lake and Cactus Lake oil properties in western Canadian to Renaissance Energy for $220mn.*

BP Amoco has revealed plans to drop *the Amoco name and shield emblem and to begin branding all activities under the letters BP later this year.*

Shell is reported to be selling its 80% *interest in Shell CO2 Company – which produces, markets and transports carbon dioxide for enhanced oil recovery projects in the western US – to Kinder Morgan Energy Partners in a deal valued at $185.5mn. Kinder already holds a 20% stake in the company.*

Occidental Petroleum is understood to *be selling its 29.2% stake in Canadian Occidental for C$1.2bn. Canadian Occidental will acquire half of the US company's stake for C$600mn, with the Ontario Teachers' Pension Plan Board taking the remainder.*

Russia & Central Asia

Former Vice President of BP Amoco, *Robert Sheppard, has been elected the new CEO of Sidanco.*

Komineft, part of the Lukoil group, is *to acquire BG North Sea Holdings 50% stake in KomiArcticOil for $28mn.*

The Russian Ministry of Fuel and Energy *has increased export quotas from 5% to 10%, starting 1 March 2000, reports the United Financial Group's Russia Morning Comment. 'On the surface this appears to be good news for Russian companies, as there is still a $60/t net-back gap between the export and domestics markets,' comments UFG.*

Lukoil has signed a memorandum of *understanding with the Iranian oil authorities on its potential involvement in upstream and downstream projects in Iran, reports the United Financial Group's* Russia Morning Comment. *Lukoil plans to develop refining and marketing operations in the country, where many obsolete refineries were built with Soviet equipment.*

Asia Pacific

PetroChina, part of China National *Petroleum Corporation, is reported to have reduced the size of its initial public offering from 15% to 10% of the company's enlarged share capital.*

NEWS Downstream

Going green with BP Amoco

BP Amoco has introduced a new ultra-low sulfur petrol – BP Cleaner Unleaded – to replace the current regular unleaded 95 octane petrol sold at its service stations in and around Edinburgh. According to the company, if the new fuel were to be rolled out nationwide, the reduction in hydrocarbon emissions would be equivalent to removing nearly 3mn petrol vehicles off the roads in the UK.

'The product is available at no extra cost to the motorist and will enable unleaded drivers to make a positive contribution to improving the local air quality,' commented the company. It is claimed that vehicles running on regular unleaded 95 can switch to BP Cleaner Unleaded without any adjustment and without any reduction in performance. It is also said that the two fuels can be regularly mixed and drivers are able to fill up at the pump in the normal way.

Manufactured at BP Amoco's clean fuels refinery and petrochemicals plant at Grangemouth, which is just outside Edinburgh, the fuel is claimed to meet European regulations for 2005 and to be five years ahead of its time with sulfur levels being reduced by 66%. The environmental benefits are said to include a reduction of hydrocarbon emissions by up to 25% and less carbon monoxide and nitrogen oxide emissions. Cleaner Unleaded also contains advanced detergents to keep engines clean and improve performance.

New UK gas trading arrangements approved

UK gas industry regulator Ofgem has approved changes to the new gas trading arrangements (NGTA) which include a within-day auction that will allow Transco, operator of the national gas transmission pipeline system, to buy or sell additional capacity on the gas day. Ofgem has also approved a change that will lead to greater capacity being made available by Transco in the forthcoming monthly auctions.

Up to now, there have been monthly and day-ahead auctions for capacity on the national gas transmission system (NTS). The new within-day market for the auctioning of NTS capacity will give shippers the chance to fine-tune their position during the day.

The changes also include the proposed introduction of improved gas balancing services from October 2000. Under these services, which will either take the form of a tolerance auction or a linepack service, shippers will be able to purchase insurance against high prices if they cannot balance their demand and supply portfolio. Shippers who are out of balance at the end of the gas day must buy or sell gas from the system at prices that are determined by Transco's balancing actions.

San Lorenzo gas power project funding

BG International joint venture FGP Corporation reports that it has concluded the international financing for the $500mn San Lorenzo gas-fired power project in Batangas, on the island of Luzon, in the Philippines. The project financing comprises four loan facilities of up to 16 years totalling $375mn, and equity investments of $125mn.

Gas is to be supplied from the Malampaya gas fields offshore the Philippine island of Palawan. First deliveries are expected in 2002. As an interim measure if required, and thereafter as a backup supply, FGP has a liquid fuel supply agreement with Enron. The 500-MW plant is to sell electricity to Manila Electric Company (Meralco) under a 25-year power purchase agreement.

In Brief

United Kingdom

A cross-industry forum has been set up *to review the impact of the UK Government's policy on stricter consents for gas-fired power generation amid growing concern about the continuing damage it is causing to jobs and investment. The Pan Industry Group Against Stricter Consents comprises members ranging from gas producers and independent power generators to organisations and companies representing manufacturers, contractors and energy end-users.*

Saladin has added daily over-the-counter (OTC) broker prices for Europe and Far East oil products to its electronic Saladin Information Service (SIS). The prices are sourced from Tradition Financial Services (TFS). The price quotes will be for present day structures on out to two calendar years forward. There is also access for clients to TFS archived data dating back to 1998.

UK Energy Minister Helen Liddell has given the go-ahead to SmithKline Beecham Pharmaceuticals and Scottish Power to build a 45-MW gas-fired combined heat and power station at Irvine, Ayrshire.

Europe

Gaz de France is understood to be opening its gas distribution network to competitors from August in line with an EU Directive aimed at deregulating the European gas and electricity markets.

Petroplus Tankstorage Neuss has sold its Tanklager Hamm-Uentrop storage depot in Germany to Pusback und Morgenstern Neutrale Tanklager for DM950,000 (euro486,000). Petroplus acquired the depot as part of its takeover of Germany company Cargill in 1999.

The Argentinian authorities are reported to have told Repsol YPF that it must sell around 800 service stations and oil refineries – as agreed when Repsol and YPF merged their operations – as a single package to a single new player in order to ensure greater competition in the domestic fuel market.

Fortum's Porvoo refinery in Finland has doubled production of low-sulfur city diesel to 3mn t/y. The company exported about 1mn tonnes of city diesel – which contains less than 0.005% of sulfur – to Sweden, the UK, Denmark and continental Europe in 1999.

NEWS Downstream

Germany secures reduced fuel tax

The European Commission has approved moves by the German Government to allow its public transport to be subject to only half of an increase in fuel tax, reports *Keith Nuthall.* The fuel tax has been designed to promote environmental good practice within the transport sector generally.

Because the tax hike gave special treatment to a particular type of transport, the EC has ruled it to be state aid, which Brussels has the power to block if it wishes. But as the fuel tax is designed to improve the environment, the Commission has stated that it has 'decided not to raise any objections'. A statement said that the Commission 'recognises that the introduction of environmental taxes and charges can involve state aid because some firms may not be able to stand the extra financial burden immediately and require temporary relief'. However, it went on to state that the Commission 'has decided that the conditions for approval are met' and 'in so deciding, has taken account of the fact that not all Member States of the EU... impose such energy taxes and that the introduction of environmental taxes therefore affects the competitive position of the relevant firms.'

The Commission announced that it has yet to make a decision on another German proposal – the exemption of certain gas and steam turbine power plants from mineral oil tax, which is also being examined under EU state aid rules.

Shell Truck-stops target Europe and UK

Shell is opening a network of Truck Port service stations across the UK and mainland Europe in a bid to meet the growing demand for en-route support services along primary transport routes.

The stations will feature high speed pumps (designed to dispense fuel at up to 130 litres per minute) capable of accommodating the largest artic or drawbar rig. Refuelling will be backed by the euroShell fuel payment card and euroShell Monitor, a new fuel cost control system which provides security and control checks. The sites will also offer drivers a wide range of services and facilities, including overnight and meal-break parking, restaurants, shop and on-site fax machines. More than 300 Truck Ports are planned throughout Europe, including 17 in the UK.

BP Amoco buys Burmah

BP Amoco has made an agreed cash bid of £3bn for lubricants and speciality chemicals company Burmah Castrol. BP Amoco expects to achieve annual pre-tax savings of $260mn by 2003 from the merger, primarily through the elimination of duplication in logistics, procurement and support services, together with a reduction in staff worldwide from the combined operation of some 1,700. The costs of implementation are expected to be approximately $390mn, which will be taken as a charge in 2000.

Argentinian LPG plant onstream

TotalFina, operator of the Cuenca Marine Austral-1 consortium, has reported the start of production at its LPG facility in Tierra del Fuego, Argentina. The plant is designed to process 8mn cm/d of gas. Annual LPG and gasoline production is forecast to plateau at 250,000 tonnes and 60,000 tonnes respectively. LPG will be transported via pipeline to Punta Arenas in southern Chile, where it will be fractionated and marketed to Brazil and Chile. The gasoline produced will be incorporated in the crude output of the TotalFina-operated Hidra field.

In Brief

***Repsol YPF and Gas Natural have** placed an order with shipbuilders E N Elcano, N F Tapias and Knutsen to build three 138,000 cm capacity methane tankers at the Astilleros Espanoles yard in Spain. The vessels are to be launched under a time charter contract for an initial period of 20 years, and will transport LNG from Trinidad and Tobago to Spain.*

***The Norwegian minority three-party** coalition administration of Kjell Magne Bondevik is reported to have fallen after being defeated in a debate on reducing emissions controls on gas-fired power which formed part of discussions relating to a White Paper on Environmental Policy. The effect will be to open up the use of gas-fired generation capacity in Norway. Despite being the fourth largest gas producer in the world, Norway has had no commercial gas use to date.*

***Shell reports that it has now made the** full range of its Rimula heavy-duty diesel lubricants available across Europe. The company states that the increasing Europeanisation of the transport industry means that operators need to have access to a consistent portfolio of lubricants across borders.*

***The Portuguese Government is understood** to have announced plans to sell 15% of Galp (Petroleos e Gas de Portugal) in the second stage of the company's privatisation. Around 11% of Galp is to be sold to a joint venture of Italy's AgipPetroli and Italgas. The other 4% will go to Iberdrola of Spain.*

North America

***El Paso Energy is reported to be planning** to sell its one-third stake in the 255-mile Destin, Gulf of Mexico, pipeline network to BP Amoco for $160mn. BP Amoco already holds one-third of the gas pipeline operation, the other third held by Shell.*

***ExxonMobil has reached agreement to** sell Exxon's 130,000 b/d Benicia, California, refinery and California fuels marketing assets, and to assign California supply arrangements to Valero Energy. In addition to the refinery, the sale involves Exxon's interest in about 240 service stations. The assets are to be purchased for $895mn plus an amount for inventories and working capital, which will be based on market-related prices at closing.*

NEWS Downstream

Asda extends UK fuel supply contract

Asda has extended its contract with Exel Tankfreight for the delivery of petrol and low sulfur diesel to over 100 of its superstore service station forecourts in the north of England and Scotland. Over 100 orders per day are placed with Exel, whose service support team based at Immingham provides a 24-hour, seven days a week service. A fleet of 12 vehicles, each carrying up to 37,000 litres of fuel, and 26 drivers operate out of depots in Aberdeen, Grangemouth, Dalston, Stockton and Immingham.

In addition to the new delivery contract, Exel is also developing a continuous improvement programme for Asda, including plans to use a telemetry-based remote ullage control system to manage forecourt fuel storage. Exel is also implementing an automated driver and delivery administration system that collates management information, allowing the customer direct access to delivery data via the Internet.

ExxonMobil sells certain US service stations

ExxonMobil has completed the sale of Exxon's Northeast and Mobil's Mid-Atlantic retail service station assets and the related assignment of supply arrangements to Tosco Corporation. The deal involves 1,740 service stations, including Mobil-branded sites in the states of Virginia to New Jersey, and Exxon-branded stations from New York through Maine.

Under the sale conditions set by the Federal Trade Commission, Tosco has the right to use the existing Exxon or Mobil brand in these states, as well as the products and services associated with each brand, for at least 10 years. The company is also to acquire undeveloped properties intended for forecourt use in the Northeast and Mid-Atlantic regions.

UK Deliveries into Consumption (tonnes)

Products	†Jan 1999	*Jan 2000	% Change
Naphtha/LDF	252,574	238,390	–6
ATF – Kerosene	726,588	736,517	1
Petrol	1,645,106	1,684,960	2
of which unleaded	1,358,667	1,541,502	13
of which Super unleaded	26,128	41,167	58
of which Premium unleaded	1,332,539	1,500,335	13
Lead Replacement Petrol (LRP)	0	143,458	–
Burning Oil	402,311	405,622	1
Automotive Diesel	1,193,521	1,177,645	–1
Gas/Diesel Oil	529,129	641,631	21
Fuel Oil	273,403	166,357	–39
Lubricating Oil	57,796	64,147	11
Other Products	708,047	611,044	–14
Total above	5,788,475	5,726,313	–1
Refinery Consumption	540,888	460,764	–15
Total all products	6,329,363	6,187,077	–2

† Revised with adjustments *Preliminary

In Brief

Russia & Central Asia

Turkmenistan has announced that it *has come to an agreement with Azerbaijan regarding allocation of capacity in the TransCaspian pipeline, reports the United Financial Group's* Russia Morning Comment. *Once completed the pipeline will carry 16bn cm/y of gas to Turkey and a further 14bn cm/y to Western Europe.*

The Russian Oil and Gas Industry Union *is reported to be planning to build a 4,000 b/d oil refinery in Latvia at a cost of $200mn.*

Gazprom is expected to soon sign a *contract with Turkmenistan for the supply of up to 50bn cm/y of Turkmen gas – equivalent to 10% of the Russian company's current production) over a 30-year period, according to the United Financial Group's* Russia Morning Comment.

Japan Energy and Showa Shell are *reported to have agreed to collaborate in distribution, refining and lubricant projects in Japan in a bid to cut costs by between Y25bn and Y30bn per year.*

Asia-Pacific

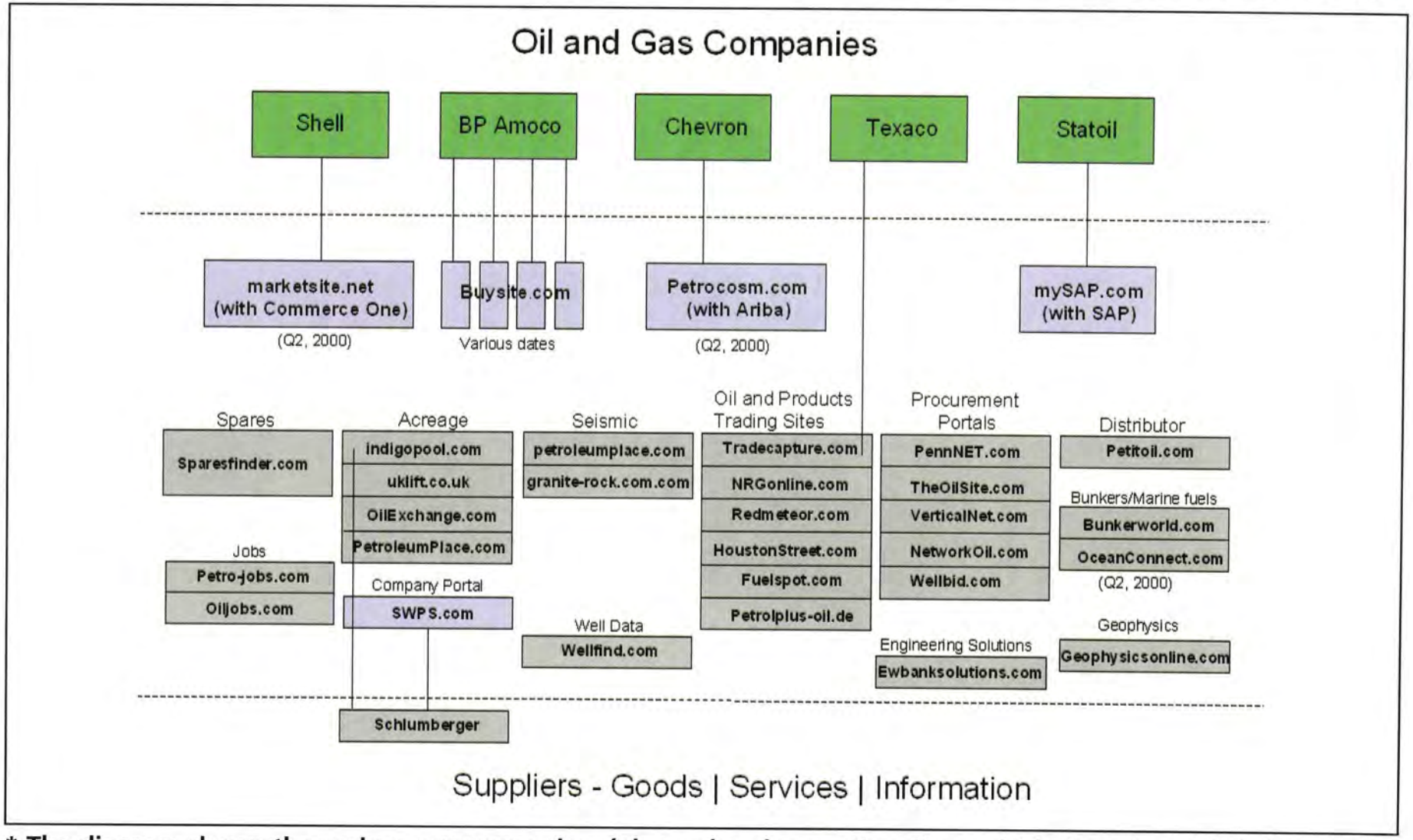
Australia is reported to be phasing out *leaded petrol nationwide by 1 January 2001 in order to improve air pollution levels. Around 2.5mn vehicles built before 1986 are estimated to be currently running on leaded fuel in the country. Lead replacement petrol is to be introduced as a replacement to leaded fuel.*

BP Amoco is understood to be planning *to open 10 more service stations in Malaysia in 2000, bringing its network to a total of 280 outlets. The company currently holds a 12% share of the Malaysian fuels market.*

Africa

Pangea Petroleum has signed a letter *of intent to participate in refining and a related facilities project in the Republic of Guinea with US Oil of Houston. The facility will be designed to handle all of Guinea's refined product requirements. It is planned to bring the project onstream one year after the final contract has been signed.*

The *Petroleum Review* guide to e-commerce sites for the international oil industry*



*** The diagram shows the main e-commerce sites (planned and operational) on which there is public information. Only sites where the primary business is e-commerce are included. We would like to receive details of any e-commerce site that has been omitted so that they can be included in later versions of the guide.**

E-business to slash costs

E-procurement could result in $10–$20bn of annual savings for the oil industry, according to a new report – entitled 'e*Oils' – by Goldman Sachs Technology Research Team. The stockbrokers forecast that e-procurement will be the fourth major cost reduction driver, following in the wake of benefits from new oilfield technologies, productivity gains via restructuring and outsourcing, and the recent spate of mergers and joint ventures. *Brian Davis* reports.

With a global integrated oil spend estimated to be $215bn, a switch to e-procurement promises to yield between 5% and 10% savings on equipment and services, according to Goldman Sachs estimates. This figure compares favourably with potential Internet-based savings in industries like chemicals (10%), steel (11%) and healthcare (5%), although it falls well behind the benefits of e-business for electronic components (29%–39%).

Arjun Narayana Murti, Vice President of Goldman Sachs and main author of the e-Oils report, says: 'The Internet revolution is coming to the oil industry and can no longer be ignored. The Internet will help oil companies meet the world's energy requirements by ushering in the next wave of cost cutting, productivity improvement, and asset high-grading opportunities for Big Oil.'

Provocatively, he suggests: 'The oil industry isn't just about the barrels anymore.'

Future acquisition and divestment via the Internet (e-A&D) will offer the opportunity to more easily liquidate low-return assets that are no longer strategically or financially important to the oil majors. 'We believe the Internet could be particularly helpful in creating liquid markets for small producing property packages, ie properties valued at less than $100mn,' says Murti.

Future growth

E-trading of commodities should also grow rapidly in the years ahead, although Murti predicts that e-trading is likely to have a greater impact on companies like Enron, Dynegy and other hydrocarbon marketers than the oil majors themselves. 'The introduction of new e-services for hydrocarbon provision, bundled serves and billing, are likely to have less impact on major oil company profitability than e-procurement and e-A&D,' he says.

The analysts believe that although most of the cost savings will be passed on to consumers, the companies that perform first and fastest will outperform those that are slower. First mover advantage will be the name of the game for e-business in the oil sector, just like other B2B (business-to-business) and B2C (business-to-consumer) markets.

This augers well for e-procurement initiatives by companies like Shell with Commerce One, who's joint venture **www.marketsite.com** B2B MarketSite portal will open for business in the 2Q2000, while Chevron and Ariba prepare to go live with the independent Petrocosm Marketplace in a similar timeframe at **www.petrocosm.com** Statoil and SAP are also preparing to provide a global B2B marketplace through **mySAP.com** Other oil and gas e-procurement initiatives include **VerticalNet.com NetworkOil.com** and **Wellbid.com**

Murti is quick to point out that not all of these sites, or others under development for that matter, are destined for success. 'It will be an open field as all oil companies, irrespective of size, will have access to Internet-based procurement opportunities.'

Broad benefits

The report highlights the broad benefits offered by e-procurement. Savings will be incurred by creating a central marketplace where currently there is chaotic use of faxes, phone and e-mails related to the bidding process. Human error will be reduced, and elimination of the middleman will cut out intermediary mark-ups and unnecessary transactions. Reduced cycle times will also streamline the business.

Oil companies will also be able to lower inventory levels as a result of receiving better information via the Internet. Murti claims: 'Inventory reductions are likely to be greatest in regional and local procurement efforts using Internet-based procurement platforms.'

A central online marketplace will also offer greater price transparency as suppliers post offers on the web. The resulting competition will drive down prices for certain equipment and services as buyers will easily compare quotes. Aggregation of many small and intermediate-sized buyers also has the potential to reduce prices further.

For an e-procurement website to achieve success, Goldman Sachs suggests it will have to demonstrate several key factors. The site will have to attract the largest number of buyers and suppliers by the 'network effect;' demonstrate scalability both geographically and by product line; have an ability to integrate with legacy ERP systems, which should prove an important driver for managers to adopt e-procurement; and offer neutrality and security.

'Neutrality is considered to be a major psychological hurdle for development of particular websites as the oil companies are notoriously secretive and mistrusting of each other,' says Murti. Like many analysts, he says the oil industry could learn from the recent announcement of Ford, General Motors together with DaimlerChrysler who are creating a single website to handle procurement activities. The auto-industry majors clearly recognised the high cost and duplication implications if each continued to focus on creating their own portals, while also having many suppliers of products and services in common.

The question of security will also influence the speed of e-business take-up by the oil companies preparing to move procurement online, in the light of recent hacker attacks on major Internet companies.

Cost savings

Murti is eager to point out that estimates of e-procurement savings can only be guesswork at this stage. 'Clearly we are in a very early stage of B2B Internet procurement activity, and all such cost savings estimates incorporate a high degree of uncertainty. Nevertheless, the economic and strategic logic underpinning the e-procurement movement appears sound.'

Goldman Sachs estimates that possible savings of $10–$20bn corresponds to 12%–25% of average aggregated oil

South Africa's first energy e-biz site

Sasol, South Africa's largest producer of synthetic fuels and chemical products, has just signed an agreement with Commerce One to create an e-procurement site. Sasol aims to reduce its own procurement costs dramatically and create new business by linking buyers and suppliers throughout the region via the Commerce One MarketSite.

Sasol produces over 150 fuel and chemical products and plans to have the e-procurement service operational by the end of 2Q2000. The company also intends to expand exports of products, which already reach 70 countries.

Peter Cox, Managing Director and CEO of Sasol said: 'We have been investigating the uses of the Internet to facilitate e-commerce for some time. By committing to the Commerce One solution, Sasol is leading adoption of business-to-business e-commerce in South Africa. The MarketSite will also benefit suppliers by allowing them to streamline their order processing and market their products and services to new customers through the Commerce One Global Trading Web.'

industry cash flows over the 1996–1998 period. Costs in the E&P activities could be reduced by $4–$8bn/y, and $6–$12bn for non-E&P activities.

According to Murti, consumers are likely to reap much of the benefit of the e-based cost savings. 'The history of the energy industry strongly suggests that a significant amount of the cost reductions will be passed through to consumers by way of lower natural gas and petroleum product prices. We see no reason to believe that Internet-reduced cost reductions will behave very differently.'

Taking a closer look at e-A&D opportunities, he says the ability to buy and sell oil fields online holds exciting promise, especially for the small to medium-sized producing property market. In 1998, some $6bn of properties valued at under $100mn were sold in the US. Expanding the market to include properties valued at $500mn or less, increases the market size to $15bn.

'Should oil companies find online property auctions beneficial, the overall market could increase significantly as more properties are put up for sale,' says Murti. He welcomes new e-A&D web sites for example Schlumberger's **IndigoPool.com** as well as the Denver-based **OilExchange.com** and the privately-held **PetroleumPlace.com** which is also headquartered in Colorado.

In the short-term, Goldman Sachs believes the online market will better serve smaller producing oil fields, in particular properties valued at under $100mn. For deals that have a heavy exploration component, buyers are likely to want to see physical geological maps and seismic data, as online versions may not provide the level of detail necessary to properly evaluate such transactions.

Murti says: 'e-A&D will offer significant benefits in terms of increased liquidity, lower transaction costs and reduced process costs. From a seller's perspective, listing properties on a highly trafficked e-A&D website should expose the property to a much larger number of buyers. As a buyer, the ability to conduct due diligence over the Internet allows the evaluation of a much larger number of potential properties than traditional methods of property evaluation.'

Transaction and process costs will be reduced considerably as data can be found easily on the Internet. As Murti concludes: 'The logistical nightmare of traditional property evaluation should be lowered meaningfully as property operating and financial data is viewed on line.'

Going Dutch

Dutch oil refiner and trader Petroplus set up a B2B portal on 20 March 2000 to trade oil products. The site – which offers a suite of integrated oil product trading and brokerage services – is initially focused on the German wholesale oil products market. It will expand to cover other European markets later this year.

Petroplus currently supplies 15% of German imports of distillates including heating oil and aviation fuel. Tom Barten, Petroplus Director of Business Development, says: 'We're hoping to increase our revenue significantly from existing customers by offering more products.'

Customers will be able to use a password-protected site to buy oil products and track their accounts on **www.petroplus-oil.de** The site was created with assistance from consultants Booz Allen & Hamilton who will provide real-time market data and information on the distributors of heating oil.

The Petroplus online oil trading initiative follows Shell, BP Amoco, Texaco and Chevron's earlier announcement this year to set up **OceanConnect.com** to trade ship fuel.

How much can Opec actually produce?

Whether 2000 proves to be a crisis year or one where oil prices ease back from levels not seen since the early 1980s will largely depend on Opec's willingness to use its spare capacity. *Chris Skrebowski* examines the data to see who has the spare capacity and how large this spare capacity actually is.

Determining 'spare' capacity is much like answering the question 'How fast will your car go?' – it all depends on the assumptions. For non-Opec capacity, however, there is an answer to the spare capacity question – there is none. At the moment the financial incentive of high prices and firm demand means that every non-Opec field is being produced as fast as possible, consistent with safety and good oilfield practice. Any new capacity brought onstream is being run up to capacity as quickly as practical.

While there is little disagreement that 2000 will see only a limited number of new developments coming onstream (partly a response to slashed E&P budgets caused, in turn, by 1998 and early 1999's low oil prices) the actual volume of additional production in 2000 is subject to a wide range of estimates.

The latest IEA monthly report (March) identifies 1mn b/d of additional non-opec capacity to come onstream in 2000. The largest single increment is in the Norwegian section of the North Sea, +300,000 b/d; followed by Australia, +160,000 b/d (Laminaria/Corallina); Mexico, +150,000 b/d; Canada, +120,000 b/d; Angola, +90,000 b/d and Kazakhstan, +70,000 b/d. The IEA anticipates demand growth of 1.7mn b/d (revised down from 1.8mn b/d in February). This gives an implied requirement for an additional 800,000 b/d of Opec production to balance supply and demand.

The Salomon Smith Barney's research team anticipates demand growth of 1.5mn b/d in 2000, but, in contrast, only expects non-Opec production to grow by 300,000 b/d (an additional 100,000 b/d each from Europe, the FSU and Africa). On their figures, Opec would need to produce an additional 1.2mn b/d over the year just to balance supply and demand. As Opec production continued to be restricted in the first quarter the actual market balancing requirement is for Opec to produce an additional 1.6mn b/d from April onwards.

The team has recently completed a reevaluation of Opec's notional capacity and the new figures are included in the table below. The latest estimates represent a 2.290mn b/d reduction from earlier estimates (in brackets), showing the way that capacity shrinks if exploration and production programmes are insufficiently larger.

A variety of estimates are available as to how much Opec needs to produce from April onwards to balance supply and demand and to rebuild stocks to more comfortable levels. The IEA has publicly suggested that an additional 2.3mn b/d from April would achieve this.

To attempt to answer the question of the size of Opec's spare capacity, **Table 1** tabulates current estimates of notional capacity against the highest output actually achieved in the last two years alongside January 2000 production and Opec's February 1998 adjusted baseline (the numbers that the output cutbacks were based on). The numbers refer to oil capacity. Opec produces 2.38mn b/d of NGLs in addition to these numbers. Opec has never explained the exact basis of the adjusted February 1998 numbers, but it is generally assumed that, with the exception of Iraq, it represents Opec's effective or useable installed capacity. The difference between the baseline and January 2000 production is 2.8mn b/d, while the difference between the countries' recent maxima and January's actual is an apparently very comfortable 3.9mn b/d. There are, however, a number of good reasons for thinking that actual spare capacity – that can easily be turned on – is much smaller. In addition, the IEA records that Opec

Country	Notional capacity		Max. prod'n since Nov 1997*		Prod'n Jan 2000	Feb '98 baseline*
Algeria	850	(930)	890	3/98	756	868
Indonesia	1,300	(1,420)	1,400	12/97	1,288	1,380
Iran	3,650	(3,800)	3,770	4/98	3,466	3,928
Iraq	2,800	(3,000)	2,850	9/99	2,200	1,700
Kuwait	2,300	(2,450)	2,220	1/98	1,928	2,205
Libya	1,450	(1,560)	1,470	3/98	1,366	1,453
Nigeria	2,150	(2,230)	2,290	1/98	1,920	2,258
Qatar	770	(770)	725	3/99	654	700
Saudi Arabia	10,000	(10,800)	8,550	12/97	7,748	8,748
UAE	2,400	(2,650)	2,420	3/98	2,089	2,382
Venezuela	3,050	(3,400)	3,500	2/98	2,772	3,370
Total	**30,720**	**(33,010)**	**30,085**		**26,186**	**28,992**

Feb '98 baseline – actual January production = 2.806mn b/d
Max. production since '97 – actual January production = 3.899mn b/d
Notional capacity – actual Janaury production = 4.534mn b/d

Source: Salomon Smith Barney, interpretation Petroleum Review
**Numbers used by Opec in calculating cutbacks in output*

Various measures of Opec's spare capacity ('000 b/d)

production increased by 0.5mn b/d between January and February.

Venezuela – 3mn b/d

Petroleum Review – as the result of personal contact with a senior PdVSA executive – understands that PdVSA believes Venezuela can get output up to 3mn b/d and is currently studying the optimum spare capacity to install, gauging this at 250,000 to 300,000 b/d. Tracking Indonesia's recent output suggests that it is on a natural decline and that, as a consequence, there is little or no spare capacity. This would fit in with the likely impact on investment of recent social and political upheavals in Indonesia as well as the economic problems caused by the Asia crisis.

Iran appears to be having difficulty maintaining production levels with large month-to-month swings. Iraqi capacity is even harder to call as it depends on the flow of equipment and spare parts to maintain production levels. This is quite apart from any political restraint on output levels to apply pressure for the release of funds for spare parts or to have the UN embargo lifted. Spare capacity levels in the other Opec countries generally look plausible.

If we deflate the maximum attained by 0.5mn b/d for Venezuela, 0.3mn b/d for Iran, 0.4mn b/d for Iraq, and 0.1mn b/d for Indonesia to give a plausible estimate of immediately available capacity, the answer is 2.6mn b/d (3.9–1.3). A number which is only slightly higher than the 2.3mn b/d the IEA believes Opec needs to produce in order to balance the market and rebuilt stocks. If 0.5mn b/d of this was utilised by February, there is currently only 1.8mn b/d of immediately available unutilised capacity in Opec.

At this point we are really scraping the barrel to find additional capacity. The only countries whose notional capacity is significantly ahead of the adjusted maximum since November 1997 are Saudi Arabia, 1.45mn b/d; Kuwait, 80,000 b/d; and possibly Iraq – although this would require full or partial lifting of UN sanctions. To achieve any of these additions would require time, investments and rehabilitiations.

Less spare than supposed

Even Saudi Arabia may not have as much spare capacity as is generally supposed. Until the early 1990s, Saudi was able to maintain its capacity by the drilling of a quite limited number of exploration and development wells, around 50–90/y. Over the last few years this number has increased dramatically.

According to the OAPEC monthly bulletin (November 1999) exploratory and developmental wells drilled in Saudi Arabia were 183 in 1994, 169 in 1995, 182 in 1996, 305 in 1997 and 320 in 1998. Although circumstantial evidence, this strongly suggests Saudi Arabia is starting to have to invest heavily in order to try to maintain capacity.

There are of course too many variable for capacity calculations to be done with great confidence. The figures do, however, clearly indicate that the international oil industry is dangerously short of immediate capacity and there is very little margin for error if current firm prices and tight supply are not to tip over into a supply crisis.

Foreign investment to boost production

Despite numerous announcements by the Islamic Government during its two decades in power to diversify the economy away from oil, Iran still remains a one-crop economy with oil exports accounting for some 85% of the budget revenues. Dr *Mojgan Djamarani* looks at the latest developments in this sector.

The Iranian economy is still grappling with the set backs it suffered as a result of the sharp decline in oil prices in 1998 and early 1999. Because the economy is heavily subsidised (to the tune of $11b/y) the $5bn/y budget deficits over the last two years has meant closure of numerous factories and severe curtailment of industrial investment. GDP for the current fiscal year ending on 20 March is expected to be only 1.9%, down a percentage point over last year.

The budget for the current year forecast revenues of $12.1bn from oil and oil product exports, compared with $9bn in 1998. However, any gains that the government hoped for from higher oil prices have been wiped out by the severe drought that has forced the country to purchase large quantities of grain on the international markets. Additionally, Iran has to pay between $2bn and $3bn per year on external debts estimated at $13bn.

The country's economic plight has forced the government to reassess its restrictions on foreign investments in the economy. The process, which began under the Presidency of Hashemi Rafsanjani, has gained in momentum under President Khatami. Given the strong performance of reformers and moderates in the recent parliamentary elections, foreign investment and finance will more likely be assigned a more central role in the economy.

Since the Islamic revolution, the combination of the government distrust of foreign oil companies and general western antipathy, not to mention a bitter eight-year war with Iraq, has led to a significant investment shortfall in the economy and the oil sector in particular. The latter is manifested in an underexploitation of Iran's existing proven reserves and increasing number of ageing fields, together with a diminished rate of new field discovery.

Since the days of the Shah, piecemeal attempts have been made to diversify the economy away from a reliance on oil revenues. Decades later, with the successful diversification no nearer to implementation, the current leadership knows only too well that only maximising oil revenues can provide the rapid pay-back required to keep potential popular discontent placated.

After a period of growing disillusionment with the original aims of those that took control after the 1979 revolution, the reformers (largely supporters of President Khatami) now see an opportunity to bring in foreign capital and expertise without allowing too much compromise on the ownership of the oil and gas fields. Hence, Iran's unconventional contractual arrangements (i.e. buy-back).

Increasing oil and gas revenues

Part of the strategy of maximising oil revenues is the greater use of natural gas resources. If Iran can convert more oil-fired facilities to gas, this will leave more oil available for exports. Oil is much easier to export to distant markets than gas, and only requires relatively easy and rapid refurbishment of existing offloading facilities. In addition, gas which is currently flared off could be used to enhance oil recovery from ageing fields.

Iran holds the world's second largest gas reserves and so far has done very little to tap into them. With 16% of global reserves, the country only accounts for 3% of total gas production. At present Iran uses natural gas to meet 40% of its primary energy demand – this figure is expected to rise by 1% per annum.

Iran also hopes to export its gas. It has already secured a contract to supply Turkey with 190bn cm of gas over a 22-year period starting September 2001. Its longer-term plans envisage exports to Europe, India and Asia (LNG).

The opening up of Iran's oil and gas sector is also partly spurred by the plans conceived under President Rafsanjani to increase oil production to 7.0mn b/d by 2010, from current levels of 3.359mn b/d. Many analysts believe that this target is merely a bargaining counter to be used at a later date to convince fellow Opec members to allow a substantial increase in output.

Current developments

In any case, even with the recent liberalisation and with foreign investment entering the sector, it is very unlikely that such a target could be achieved in such a short period of time. When in 1998 Iranian oil ministry officials started to venture on a worldwide charm offensive, they hoped to capture about $12bn of new investment in over 40 projects. Thus far only about $5bn has been pledged in five offshore projects.

Currently oil production stands at 3.359mn b/d following the Opec April 1999 quota agreements to boost oil prices. Five onshore fields (Ahwaz, Marun, Gachsaran, Agha Jari, and Bibi Hakimeh) alone account for two-thirds of total production. Offshore oil production of around 500,000 b/d primarily comes from Doroud 1 & 2, Salman, Abuzar, Foroozan, and the Sirri C & D fields. Most onshore and offshore fields are entering late stages of development. This has prompted state oil company, NIOC in recent years to direct efforts to the discovery of new fields, having neglected exploration activity for over 20 years, and to bring online as yet untapped reserves.

Several new discoveries have been found, such as the offshore Darkhovin oil field with 2.5bn barrels of oil and two onshore fields near Gavaneh which hold combined reserves of 100mn barrels. Most of the exploration work has been directed at discovering new offshore fields in the Caspian and the Gulf.

Shell, in a joint venture with Lasmo and Veba Oil and Gas, is currently involved in a 2D seismic survey and geophysical study of the South Caspian Sea. According to the agreement signed with the NIOC, the exploration and appraisal (E&A) study will take place over 18 months, extendable to 24 months, and will cover an area of 15,000 sq km. The consortium will have preferential option to select up to six blocks each of approximately 2,000 sq km, for which it can negotiate agreements for development and production. The consortium will bear the full $25mn cost of the E&A programme, for which it will be reimbursed from the revenues of the development phase of the project if oil is discovered.

A number of oil companies have successfully bid for acreages on buy-back terms. The first to do so was Total of France who replaced Conoco in the development of

Sirri A and E fields. Conoco had to pull out because of the US Iran–Libya Sanctions Act of 1996. With its junior partner, Petronas, Total put Sirri A onstream in October 1998 and Sirri E in February 1999. The development programme for the fields call for production of 100,000 b/d by summer 1999. Under the terms of the buy-back contract Total/Petronas will have five years from the time of the commercial flow of the fields to recoup their investments of $600mn from revenues generated by the sale of crude and seek remuneration. The agreement gives Total/Petronas the right to sell off any associated gas not used for reinjection. The two companies are also involved in upgrading storage facilities at Sirri Island. Total has also made proposals to NIOC for the development of Sirri C and D.

In April 1999 Elf Acquitaine and Canada's Bow Valley Energy signed a buy-back contract for the development of the offshore Balal field with reserves of 105 mn barrels. Although the field has been untapped, an oil pipeline already connects it to the Lavan Island export terminal. The joint venture hopes to produce 40,000 b/d by 2001.

Elf, with Italy's Eni, is also involved in a $540mn deal to upgrade and expand the Doroud offshore oil and gas field. Output is planned to increase by 9,000 b/d to 220,000 b/d by 2003 and will involve enhanced oil recovery gas reinjection from the field's associated gas.

Iran's biggest offshore oil deal has been with Shell to develop the Soroush and Nowrooz fields with combined reserves of 1bn barrels. Signed in late 1999 and worth $800mn in investment the agreement envisages combined production level of 190,000 b/d some 45 months after signature. The fields which were brought online in 1967 and 1970 were badly damaged in the course of the Iran–Iraq war.

Onshore, NIOC has brought several small fields online (Nargessi 50,000 b/d; Kilur Karim 10,000 b/d; and Kavanaga 5000 b/d). For the first time since the revolution Iran is offering acreage onshore to foreign bidders. Priority is given to secondary recovery schemes for the mostly untapped Bangestan reservoirs at Ahwaz, Mansuri and Ab-Teymour oil fields as well as separate development projects at Darkhovin, Cheshmeh Gosh and Dehloran. The giant Azadegan find with estimated reserves of 26bn barrels has also been put up for development. The field is located close to Iraqi border, covering an area of 520 sq km, and reportedly has the potential to produce up to 400,000 b/d. So far 16 oil companies have tendered bids for onshore acreages including one by BP Amoco for the Bangestan fields. NIOC is expected to make a decision by the end of the current Iranian year on 20 March.

Iran's biggest buy-back deal has been the development of the South Pars gas field's phases 2 and 3. An agreement was signed with a consortium of Total, Petronas and Gazprom worth $2bn in 1997. Production from each phase is planned at 1bn cf/d, with phases 2 and 3 entering production in June and September 2001 respectively. The gas is to be used primarily for domestic purposes and only then for exports to Turkey. Further development of the South Pars field would depend on whether Iran can find markets for its export.

Foreign investment in the oil and gas sector still amounts to less than $5bn and the biggest deal, the $2bn South Pars development, was signed long before NIOC's moves to woo foreign investment in late 1998. Part of the problem has been the Iran–Libya Sanctions Act passed by the US Congress in 1996 that bars American companies and their subsidiaries from projects worth more than $20mn in Iran. There is a lot of hope that under a new president the sanctions will be lifted.

Iranian buy-back terms

A bigger part of the problem is the unconventional contractual terms of the buy-back. Buy-backs are essentially risk service contracts under which the foreign contractor provides all the investment capital. It is reimbursed from the sales of oil and gas once a field enters commercial development. In the case of Total in the Sirri fields, Total had to produce 25,000 b/d over a 21-day period from Sirri E before it could begin to recover its costs. The renumeration in buy-back is based on a fixed rate of return and is paid by NIOC by allocating the foreign contractor a share of production equal in value to the amount due.

Exploration and appraisal buy-back deals, such as that of Shell/Lasmo/Veba in the South Caspian Sea, are even riskier for the contractors since they have to bear all the costs of the project and have no guarantee that they will be awarded the development phase of the project. So that the best they can hope for is to recover E&A costs.

Although the Iranian Government is championing buy-back as a means of circumventing the parliamentary limits on external indebtedness, buy-backs are neither in Iran's favour nor that of the foreign contractor. By offering a fixed rate of return NIOC bears all the risks of low oil prices. From the foreign contractors' point of view, there is nothing to be gained above their internal rate of return. In the E&A cases they may not even get to develop their discoveries and even if they do, they lose operatorship. Furthermore, any increases in projected investment costs will have to be borne out by the contractor and are not recoverable.

Under buy-back it would be in NIOC's interest to prolong the payment period to as long as possible. In periods of high oil prices, buy-back might well appeal to foreign investors but to some it appears to be also very risky, especially on long-term projects.

The poorer than expected response to NIOC's buy-back projects prompted the government in October 1999 to create an independent entity, NIOC International, to negotiate contracts with foreign investors.

Future prospects

It has not gone unnoticed in Iran that competition brought on by foreign investment in the Caspian reservoirs and pipelines could undermine its arrangements to supply oil and gas to local markets such as Turkey. However, Iran has many more geographical advantages which mean that providing more encouragement to foreign companies could result in not only maintaining existing markets but also by expanding them.

Some cracks seem to be appearing in Iran's parliamentary restrictions on foreign investment. The constitution still bars NIOC from entering PSAs (production sharing agreements). However, under a law passed in February 1999, foreign investors are now allowed to hold an equity share stake of up to 49% in Iranian refineries. More recently, flexibility has been shown on E&A buy-back deals. New measures introduced allow the foreign contractors that carry E&A activities, but which fail to negotiate subsequent development deals for the oil/gas fields they discover, to be automatically offered a minimum 30% stake in the resulting development contract. The South Caspian E&A project could provide a test case.

Iran is trying to augment its global profile by becoming a conduit for Caspian oil. It provides the most cost-effective option for the landlocked Caspian states who want to reduce their dependence on the Russian delivery system or expensive pipeline routes through politically unstable countries to Turkey. Oil from the Caspian could be supplied to refineries in North Iran, in return for Iranian oil in the Gulf.

Although a pipeline connection between the port of Neka, on the south-eastern coast of the Caspian to the Tehran refinery already exists, Iran is building a new 324-km long wide-bore pipeline with initial capacity of 175,000 b/d that will increase the flow of Kazakh and Turkmen oil to 350,000 b/d. NIOC claims that netbacks to Caspian producers could be at least $1/b more if oil was exported through Iran. With less political mistrust from Washington, Iran could end up being the beneficiary of both direct foreign investment as well as the even greater investment made in the Caspian countries to the North.

Oil tanker production – a specialist business

European legislation is slowly but surely taking over from UK legislation covering the design and production of road tankers and, as a result, the tanker manufacturing industry is consolidating. *Gibb Grace* reports on how one manufacturer, Heil Trailer International, is responding to this latest development.

Road tankers are subject to the ADR Directive (94/55/EC) which is a European agreement concerning the international carriage of dangerous goods by road that the UK adopted in September 1996. Today in the UK, three sets of regulations cover the classification, packaging and labelling of dangerous goods; the training and certification of dangerous goods vehicle drivers; and the transport of hazardous materials in containers, tanks and vehicles. These regulations are enforced by the Health and Safety Commission (HSC) who, in turn, produce 'approved documents' which effectively control all aspects of road tanker production and operation. In essence, all those who design, build and maintain the vehicle chassis and tanks – and the transport operators that run them – must comply with the HSC documents.

Quite rightly, these moves have put pressure on the road tanker industry to improve both its products as well as its quality control. This, in turn, has inevitably led to some consolidation amongst manufacturers. The established UK tanker manufacturers – Thompson Brothers and Carmichael, for example, were merged in the early 1990s and that company, Thompson Carmichael, was itself bought by Heil Trailer International of Chattanooga, Tennessee, US, in 1998 and renamed Heil Trailer International.

Heil Trailer International,which was founded in 1901 and controlled by the Heil family until it was bought by the Dover Corporation in 1993, has a long history of tanker design and is now recognised as a global leader in tank trailer design and manufacture. The UK subsidiary is based on the original Thompson site at Bilston in the West Midlands, and is headed by Managing Director Bill McGawley. Sales and Marketing Director, Chris Dalton, is supported by Regional Sales Managers Doug Watts, Peter Havis and Ken Fisher.

All-aluminium construction

Heil prides itself on quality work and, although it has been accredited to the ISO 9001 international quality assurance standard since the mid 1990s, it is reorganising its production to improve quality still further. The original manufacturing line has been upgraded and given over to powder tanker production. A second line has been added that is dedicated to petroleum tanker production. At the same time, the emphasis has moved heavily in favour of all-aluminium construction. Doug Watts explained that the price premium normally associated with aluminium had been largely eroded. He continues: 'Production techniques have improved to the point where the purchase price of an aluminium tanker is now close to that of mild steel.' As a result, the core production is now predominantly in aluminium, although mild steel will remain an option for some long-term customers.

Although Bilston had considerable experience of aluminium tanker production over the years, it wasn't until 1993 that it introduced a complete range of aluminium road tankers – the 5000 Series – designed for operation at 38, 40 and 44 tonnes gross. This model was claimed to be revolutionary in that it was a self-supporting, 'chassis-less' monocoque design. Its kerb weight was 5,000 kg, representing a saving of between 1,000 and 1,500 kg over contemporary mild steel designs of the day.

In operational terms, at 38 tonnes gross, the 5000 Series could carry an extra 2,500 litres of product and had a maximum capacity of 41,500 litres. Seam welding on this scale called for new techniques and the 5000 Series pioneered the now established circular seam construction that completely eliminates any possibility of inter-compartmental leaks. The new tanker range made a very big impact on the industry at the time, and has since proved extremely reliable. There are now over 350 units in service in the UK with a number of oil companies, which includes Texaco, Murco and Conoco.

ADR compatible design

The experience gained from the 5000 Series put the company in a strong position as the UK moved towards ADR legislation. In anticipation of ADR tanker design becoming mandatory, it produced the ADR 5000 Series in 1998. The company has built and delivered 70 units to date. While this design used similar, proven construction techniques, the cross-section was changed from the original maxi-section to a true ellipse in order to lower the centre of gravity. The end plates, compartment divisions and baffles were changed from the original corrugated design to a dished design and the skin thickness was increased from 4 mm to 5 mm. These changes, however, added some 80 kg to the kerb weight, and so a new aluminium bogie sub-frame was designed to offset the increase.

The sub-frame plays a key role in the design, as it has to distribute the bogie load of up to 22 tonnes into the tank structure. All tanks run on air suspension – however, different sub-frames are used to suit individual bogies from suppliers such as BPW, Discos, Meritor and SAF. Doug Watts says that because of this detailed design, the advanced ADR 5000 Series tanker can still carry a payload of up to 41,500 litres.

The ADR tanker regulations are well understood and are unlikely to cause surprises when they are adopted on 1 June 2001. The same cannot be said of sealed parcel systems (SPS) however, which became mandatory on 1 January this year (see *Petroleum Review*, March 2000). This is still the subject of much discussion, and according to Watts, has caused a major rethink in the industry while operators take stock of the implications.

Much improved braking

Any company ordering new ADR tankers will also be able to take advantage of the latest developments in braking. Doug Watts says that around two-thirds of customers are already specifying disc brakes and he is convinced that percentage will rise again this year. Disc brakes in themselves do not necessarily provide better braking performance in terms of stopping power as they are subject to the same braking Directive. The full advantage comes when the unit and the trailer brakes are controlled by an electronic braking system (EBS).

Mercedes-Benz was the first truck manufacturer to introduce disc brakes and EBS, followed by Scania, Iveco, Volvo and most recently by Renault V.I. In the past, trailer brakes have been signalled by air pressure which had to build up in the line from the foot brake to the rearmost brake actuator. This took a finite time of say 0.5 second and in that time, a truck travelling at 20 m/s (45 mph), would have travelled 10 metres, or the length of two cars. With electronic braking however, the brake actuator is signalled electronically, giving a near instantaneous response, eliminating the traditional delay and shortening the overall stopping distance.

Thankfully, the need for full power braking is rare. However, the need for safe, controlled braking is paramount and EBS fulfils this role too. To achieve stable braking each axle must provide the just the right amount of stopping power to cope with the load imposed on it. This is done to some extent with traditional systems, but with nothing like the accuracy achieved with EBS. EBS takes continual account of the vehicle loading and interacts with the ABS function to provide the best possible braking at all times.

The EBS will take into account different foundation brake characteristics between the tractor and trailer, but the latest thinking is to match the brakes across the entire unit. Discos, part of DaimlerChrysler, is already offering trailer axles which can be fitted with different brakes, so as to match the unit. The main advantage of this so-called integrated braking, is not better performance, but rather a reduction in maintenance costs. With a six-axle outfit there are savings to be made if all six axles use, say, the same rotors and pads, rather than two different types.

Specialised products and services

Doug Watts says that two, three and four-axle rigid vehicles are still popular for the domestic oil business, and that here too aluminium tanks are becoming the norm. These offer a significant payload improvement and their working life has been improved by an all-new, three-point mounting system.

Heil Trailer International builds predominantly aluminium road tanks

Tank sections are continuously welded by machine for consistency

Nonetheless, Watts also senses a move towards tractor/trailer units in this part of the business. He says two-axle units coupled to a 9-metre tandem axle trailer running at 32 to 35 tonnes can carry 28,000 litres and are taking over from three and four-axle rigids.

Heil's all-aluminium urban artic trailer weighs 4,500 kg, has a 21-tonne payload at 32 tonnes gross and can incorporate a steering rear axle to improve manoeuvrability. 'Products like this are our future,' says Watts, 'but we are also concentrating on expanding our customer services. We offer leasing and rental and are about to introduce a part exchange facility. We also offer, to customers and non-customers alike, a tank tightness testing service.'

The road ahead

The road tanker business is becoming increasingly regulated and it is demanding ever more specialist products. Heil Trailer claims to be in good shape to respond. Doug Watts says: 'By an odd quirk of fate, 2001 marks not only the year in which ADR tanker design becomes mandatory, but also the centenary of our parent company. We are far from complacent though, and pushing as hard as ever.'

A 9-metre long, 32-tonne urban artic tanker supplied to BP

E-volution of the petroleum supply chain

'Companies no longer compete against one another; rather, their supply chains compete against their competitors' supply chains. As a result, effective supply chain management has become imperative to the future success and survival of companies operating in the downstream petroleum industry.'* *Bill Miller*, Director European Operations, Petrolsoft, looks at how technology has improved supply chain management over the years and reports on what the Internet can do for this sector.**

Many industry experts are pointing to the increasing importance of effective supply chain management (SCM) as the key to sustainable profitability for petroleum companies. In an era of mergers and acquisitions which are aimed at leveraging economies of scale and maximising operational efficiencies across organisations – new technologies and the application of advanced SCM tools via the Internet are revolutionising the way in which petroleum companies control the distribution of product along their supply chain.

SCM in the petroleum sector is an inherently complex process. It must take into account many variables and constraints, while meeting demand requirements from every entity along the supply chain, at the lowest distribution cost possible. At the same time, it is also necessary to maximise opportunities for higher profit margins.

At the retail level, for example, customer sites may have restrictions on delivery times, delivery equipment type, or even physical restrictions on accessibility that must be taken into account when planning a distribution route. The trucks themselves are subject to constraints with regards to policies and procedures that regulate how fuel is loaded and unloaded from the truck, which sites a particular distribution resource is allowed access to, and when a truck is available for use on the road.

On the wholesale side, similar constraints affect the development of distribution schedules and plans. Pipeline contracts and regulations, trade and exchange obligations, and other external factors may also impact schedule development. Because batch size can be quite variable, carrying costs, together with product costs and transportation costs, must be factored into the analysis of how best to meet demand.

The inherent volatility of demand is a variable that can be overcome to a certain extent through proper analysis of historical demand information. The increasing saturation of point of sale (POS) systems and tank level monitoring systems continues to provide a wealth of demand data that can be leveraged by SCM tools to develop extremely accurate forecasts together with replenishment plans.

Reflex reactions

Historically, SCM for the petroleum industry was a reflexive process – as inventory levels approached a 'run-out' point, replenishments were ordered to restock the inventory. However, this 'ambulance service' model posed significant problems for both the customer and the supplier in the form of costly operational failures.

On the retail side, run-outs and no-fit situations were common occurrences because of this model. The customer, looking to conserve capital by ordering a replenishment as late as possible, would end up miscalculating the run-out time and suffer a costly loss of revenue as customers turned to his/her competitor until the replenishment arrived.

On the other hand, if the customer ordered the replenishment early to avoid a run-out, the customer ran the risk of causing a retain because of insufficient available storage in his/her tanks. This of course, was a costly and a dangerous operational failure that increased transportation cost and was to be avoided. Meanwhile, demand for transportation resources was volatile, requiring more on hand resources to handle demand peaks.

From a wholesale perspective, the many complexities inherent to the business, coupled with the dangerous and costly ramifications of operational failures along the wholesale supply chain, made it impossible to evaluate every possible opportunity for trade along the petroleum supply chain. Armed only with few tools, and with the pressure of pipeline schedules bearing down on them, it would be too much to expect traders and schedulers to evaluate the profitability of every trade option and weigh them accordingly to select the most profitable combination of options.

Technical progress has brought about the creation of computers and software that now have the power and intelligence to take into account every possible variable and constraint in the analysis process. Such systems return fuel distribution schedules that not only minimise distribution costs and operational failures, but also interpolate the wealth of data available electronically (like POS, tank level monitoring (TLM), onboard and at-rack computers, online pricing systems, etc.) to help companies select the most profitable trade option based on the latest prices and actual distribution costs.

Furthermore, the exponential increase in computing power over the past several years has opened the door to powerful optimisation engines running carefully researched algorithms that perform millions of operations per second to offer vastly improved planning and scheduling capabilities.

A comprehensive SCM tool for the petroleum industry should leverage this new technology and the availability of information to provide the following functions:

- *Rate demand* – Consolidate and leverage historical consumption and replenishment data to smooth out the volatile demand curve, enabling better planning to avoid run-outs and retains.
- *Replenishment planning* – consolidate replenishment orders for inventory managed accounts with manually entered replenishment orders; analyse and reconcile the replenishment plan for data errors or anomalies; prioritise according to delivery windows; and produce an executable replenishment plan.
- *Optimise scheduling and trading* – Accept the completed replenishment plan and evaluate all possible trade and transport options to determine lowest cost/highest profit distribution alternatives while maintaining 100% of critical replenishment deliveries.
- *Minimise working capital requirements* – By understanding optimal distribution requirements (both in product and equipment), companies can reduce the amount of working capital required, freeing valuable money for other business needs. For example, a comprehensive SCM tool can help uncover under-utilised truck fleet resources and minimise extra petroleum product in storage tanks/underground which can lead to significant savings that can be reapplied or reinvested for a return.

These same technologies can be used strategically to determine the optimal supply network to maximise profit margins.

Benefits of unified SCM

Petrolsoft's *Supply for Retail & Supply for Wholesale* software suite has been successfully implemented for clients around the world, these include ExxonMobil, Chevron, Caltex, BP Amoco, Tosco, Marathon Ashland, Ultramar Diamond Shamrock, amongst others. At each of these clients, the benefits of a unified SCM system have become readily apparent through marked decreases in operational failures and significant reduction in overall distribution costs, as well as through dramatic reductions in stranded inventories and cost per volume delivered.

At pre-merger Mobil, Petrolsoft's Supply for Retail was implemented and in daily use at the oil company's dispatch facilities to move every gallon of domestic petroleum product sold in the US. Dispatching to over 4,300 retail sites every day, the software package posted the following benefits:

- $13.1mn logistics cost reduction
- $8mn terminal inventory reduction
- 85% reduction in product runouts
- 29% increase in inventory turnover
- 22% reduction in retail inventories
- estimated 15% reduction in secondary transportation costs

Role of the Internet

As remarkable as the benefits of modern SCM tools are today, the Internet promises to provide even greater benefits in the near future. The Internet is facilitating the aggregation and management of complex data from sources that were previously inaccessible or difficult.

The ubiquity and accessibility of the Internet is providing a framework to make useful sense of large amounts of granular supply chain data. This is fundamental to leveraging the information that originates at the transaction level to guide top-level management decisions that will ultimately impact the profitability of a petroleum company's operations.

Purchasing, trading, and production will all have the 'visibility' required to make decisions that will maximise margins and streamline operations across the organisation.

Furthermore, the use of the Internet will offer increased customer loyalty and improved customer service due to the highly customisable content and reduced customer service resource requirements.

It should be noted that a web-enabled SCM system is not a substitute for a traditional unified supply chain – it is an extension or an evolution of SCM that leverages the power of the Internet to build on the capabilities of a unified supply chain.

'eChains' will allow every entity along the entire petroleum supply chain access to mission critical information that will help improve their business, the health of the supply chain as a whole, and the profitability of the entire business. Retail customers will have effortless access to replenishment ordering, tracking, and planning via the Internet, while wholesale traders will be able to leverage the wealth of information available on the Net to improve their visibility and make more informed, more profitable decisions for petroleum companies. Meanwhile, third-party logistics providers will be able to leverage handheld computer technology integrated with the eChain via the Internet, to lower costs and maintain profitability.

These developments towards web-enabled SCM are inevitable. By its very nature, the petroleum industry is uniquely positioned to take full advantage of the benefits that the Internet will provide to our businesses. By extending the invisible fingers of the Internet all the way down to the most granular levels of information, and leveraging both it and computer technology to distill and extrapolate the valuable information available, petroleum companies will be able to truly rate demand from the end consumer and use that information to optimise distribution, storage, refining, and even production for maximised profitability. ●

**Quotation from PricewaterhouseCoopers*
*** Based in San Diego, US, Petrolsoft provides unified supply chain management systems as well as e-business/e-commerce solutions to the global downstream petroleum industry.*

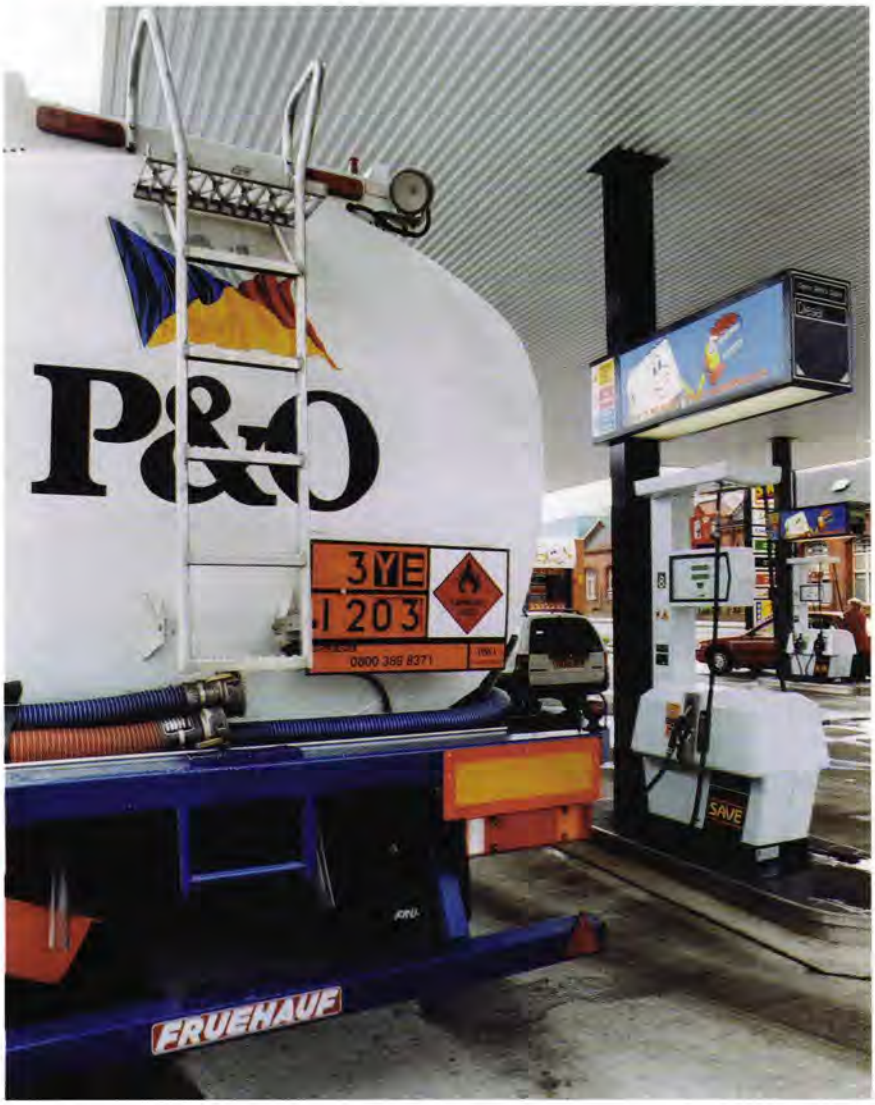
Trading fuel on the Internet

Petrolsoft has introduced **FuelTrader.com** – a new Internet portal for business-to-business (B2B) and business-to-consumer (B2C) online buying, selling and trading of petroleum products. The site will initially focus on trading petrol and diesel, although there are plans to extend the service to include jet fuel, kerosene and heating oil in the future.

According to Mark Christenson, Vice President of **petrolsoft.com**, the company's Internet solutions division: '**FuelTrader.com** is the natural evolution of advanced petroleum supply chain management. It will transform static, isolated supply chains into efficient, productive and profitable web-based, digital marketspaces.'

The company claims that its new site differs from other industry portals because it integrates state-of-the-art front-end capabilities with unified supply chain solutions to create a fully integrated web-based digital marketplace. Contracts that come in over the Internet are automatically rolled into the company-developed supply chain management and planning tools to ensure that product is available for 'pick up' at the lowest possible cost.

'Many e-businesses have created incredible online storefronts without considering the critical issue of integrating the back-end fulfillment process,' comments Petrolsoft CEO David Gamboa. 'This failure to integrate is a key factor in poor e-business operating results.' ●



Going the extra mile

Karl Hudson, General Manager of P&O Trans European's Road Tanks Division* fuels the logistics debate by arguing that innovation and partnership will drive cost out of the petroleum supply chain.

Oil companies have invested millions of pounds in research and development to ensure that modern fuels are clean, green and work with a car's engine to go the extra mile. This analogy also applies to the petroleum supply chain. Here, the oil companies have refined the mix by increasingly outsourcing their logistics requirements to third-party providers who are going the extra mile in terms of innovation and cost and efficiency savings in getting fuels to their market.

Indeed, I believe how we continue to add value will soon become the key differentiator between logistics providers in the oil and petrochemical industry as e-commerce moves up a gear and makes us all redefine the way we do business in the future.

Value for money

While there is nothing new in outsourcing in the oil and petrochemical sector, it is the manner in which outsourcing is now being used to strengthen weak links in the supply chain that is providing the extra ingredient in the mix – value for money.

The logistics services sector has evolved with its customer's requirements across all business streams. Traditionally, when companies spoke of logistics they were referring to warehousing, transport and distribution. Here, the decisions to outsource were usually taken by transport or procurement managers. They would be given a weighty tender document to plough through and their job was primarily to answer the brief within the prescribed cost – woe betide them if they did not.

This 'master and servant' type of relationship still exists but, as the business has evolved, customers have recognised the cost and efficiency benefits of optimising the whole supply chain. Third-party logistics providers have evolved specialist skills in vertical sectors and have invested in the infrastructure and industry accreditation to make their offerings irresistible to their customers.

As a result, the multi-million pound solutions being provided go well beyond the transport and distribution function. The outsourcing decision is now taken at board level because of the degree of investment and the recognition of the value that it brings to the whole business. We are now seeing the development of long-term partnerships in which the logistics provider is working with the customer in a transparent 'open-book' environment. Here it is in everyone's best interests to identify where the costs lie and to develop processes that keep them to a minimum.

Complete supply chain solutions

At P&O Trans European (P&OTE) we are working further and further back up the supply-chain as we are being asked to design complete supply-chain solutions from refinery gate to the point of sale. There is a growing trend of companies asking us to identify where we can make improvements in their current systems. This is an invitation to go back to the drawing board by interrogating the entire process and in some cases, completely re-designing the supply chain. This is not making changes for change sake, but to increase efficiency and thus add value while at the same time creating industry benchmarks for others to follow. Partnership is all about trust and working together.

As part of that partnership it is our job to be challenging by asking our partners to question their existing processes in order to allow us to work together to create innovative new ways forward. In other words, going the extra mile.

The cheapest distribution solution may not be the cheapest supply chain solution. We have to keep an eye on the bigger picture to concentrate on overall cost and efficiency savings rather than short-term gains.

Take the delivery of fuels into petrol filling stations (PFS) as an example. Although the A to B transport (from storage location to the PFS) is now simply a commodity purchase, dramatic savings and environmental benefits can be made by switching the time of deliveries to late at night. Here, when there is no one on site, a cost-effective mechanism has to be found to allow vehicle and drivers to safely discharge product while at the same time meeting the legal demands placed on the industry by HM Customs and Excise and the fire officer.

Traditionally, driver control delivery (DCD) systems have been provided by the PFS and, more recently, onboard DCD systems have become available. The key to the whole process is, however, maximising the effectiveness of the DCD system while minimising the investment.

P&OTE and the oil companies have to investigate how DCD equipment can be effectively placed in the lower volume PFS so that maximum vehicle utilisation can be achieved.

Stepping on the gas

The environmental benefits of liquid petroleum gas (LPG) and liquefied natural gas (LNG) remain a topical issue in the UK's automotive industry – especially the fleet sector where the balance on residual values has been tipped in favour of LPG vehicles. In Europe around 1.5mn drivers now use LPG vehicles and the figure is set to grow in the UK as more PFS provide facilities for LPG re-fuelling on the forecourt.

This whole area provides a significant opportunity for P&OTE which is working closely with a major oil company to provide the right logistics solutions to meet this growing demand.

A brave new world

E-commerce and the greater use of technology will also enable companies such as P&O Trans European to further take cost out of the supply chain. I envisage a brave new world around the next corner where regular customers with repeat orders will be posting these requirements on a secure P&OTE website and replenishment will be carried out automatically. This will save thousands of man hours and administration costs.

In this world, I see greater opportunities for third-party logistics providers to act as true catalysts to change. They could be involved in the customer's

sales strategy because location of forecourts, for example, can have a major impact upon distribution costs.

Also, as the bigger logistics service providers control the distribution of fuels, there is no reason why we cannot optimise costs throughout the entire supply chain. With far greater transparency in the process, logistics providers can have a stronger input into the production cycle. If the customer were manufacturing in true sync with demand from his customer, there would be an enormous positive effect upon the cost of the process.

This is already working in the automotive industry where P&O Trans European is providing a synchronised delivery to the track side of European vehicle manufacturers. Supply in line sequence (SILS) means that there is no stock holding track side – this is all taken care of by P&O Trans European which must have the exact component dispatched from its nearby warehouse to the manufacturing line within minutes of an EDI-link order. If the sequence is missed, the production line goes down which could cost thousands of pounds per minute in lost manufacturing time.

In this precise environment, P&O Trans European has to have full transparency of the manufacturing process.

Packed portfolio

There is more to P&O Trans European's portfolio than transportation. We have recently introduced a new aviation fuel and terminal management division that can control the entire supply chain from the storage location, through the airport aviation fuel tank farm and finally to the aircraft wing. This supply chain can involve road transportation and/or the managing of a pipeline on behalf of the oil company.

This specialist division was established last year and is already in active discussions with a number of oil companies and airports to put such a proactive solution in place.

As long as there are vehicles on the roads that require fossil fuels, the petrochemical logistics industry will continue to innovate by creating timely solutions that reduce cost and optimise efficiencies throughout the supply chain. Customer partnership through cost transparency is not re-inventing the wheel, but is a common-sense way of going the extra mile.

**P&O Trans European's customers include BP, Conoco, Esso, Sainsbury's and Save Petroleum. The company recently secured a £35mn contract with Shell UK to distribute commercial and retail fuels throughout the UK. The contract represents one of the biggest deals of its kind to date and involves more than 400 employees, 200 vehicles and 14 locations. Under the deal, P&O Trans European took over responsibility for all Shell UK personnel under TUPE (Transfer of Undertakings and the Protection of Employment) arrangements. Outside the UK, P&O Trans European also has one of the largest petrochemical business portfolios.*

Fuel prices and taxes taking their toll on UK hauliers

1999 is likely to be remembered as a watershed for the UK freight transport sector, writes *Simon Chapman*, Economist, Freight Transport Association.* While the UK Government's fuel duty escalator led to relentless increases in diesel duty, industry has been protected from the full impact of these rises by weak world oil prices. However, we have been living on borrowed time.**

The writing was on the wall for the UK's freight transport industry even before the Chancellor of the Exchequer added 10% to diesel duty in his March 1999 Budget. Opec and non-Opec producers alike, alarmed at steadily falling oil revenues, agreed to cut production in order to reduce surplus world oil stocks. The effect of the resultant product price rises has been to add 7 pence/litre (p/l) to the price of diesel – on top of the 4.2 p/l rise announced in the Budget. Fleet operators are now hard pressed to buy diesel at below 62.5 p/l, compared with 51 p/l just one year ago.

This year, the hauliers have had to approach their customers seeking annual rate increases of 7%, principally to offset higher fuel costs. But with industry's margins already squeezed by a strong pound and static, or even falling, factory gate prices, this is proving no mean task. Faced with the inability to pass costs on, the profitability of many hauliers has been reduced to the point where they are questioning the viability of their businesses.

A new era in world oil prices?

With coffers now overflowing from oil revenue, you would think that Opec and non-Opec states would be laughing all the way to the bank. But, with high oil prices comes the danger greater oil price volatility. As oil prices rise, the temptation increases for oil producing countries to cheat on their production quotas. Furthermore, oil production capacity that was not commercially viable a year ago has become an attractive source of new revenue.

Yet, no Opec member is keen to undergo the most gruelling process within the cartel – allocating large increases in production quotas. There are already signs that Opec is 'managing' the market by informally adjusting compliance levels with the existing production restraint regime, rather than through changes in formal quotas. This route, alongside more moderate production quota increases, may well prove the most palatable to Opec members.

With the oil price likely to remain in limbo for the rest of the 2000, operators can't afford to continue on the basis that sooner or later this year fuel prices will come back down to the 1998 average price of $12/b, thereby restoring haulage margins.

Legacy of government policy

The previous Conservative Government started ratcheting fuel prices upwards through the fuel duty escalator in 1993, as part of a drive to meet UK international commitments on climate change. By signaling above inflation rises in fuel prices for a 10-year period until 2002, the government claimed that rises in carbon dioxide (CO_2) emissions from road traffic would, over time, be checked and reversed. From a baseline diesel fuel duty of 21.87 p/l in 1993, tax on diesel has more than doubled in the space of seven years to 47.21 p/l.

The current Labour Government's November 1999 pre-Budget statement announcement, that the fuel duty escalator was to be scrapped was therefore welcome news. But the industry is not out of the wood yet. Successive real increases in fuel duty since 1993 have resulted in UK fuel prices being the highest in the European Union (EU). The rate of fuel duty in the UK is 2.5 times higher than the EU average figure. In addition, UK operators of 40-tonne vehicles pay the highest vehicle excise duty (VED) rates in the EU, by an order of magnitude (see **Figure 1** and **Table 1**).

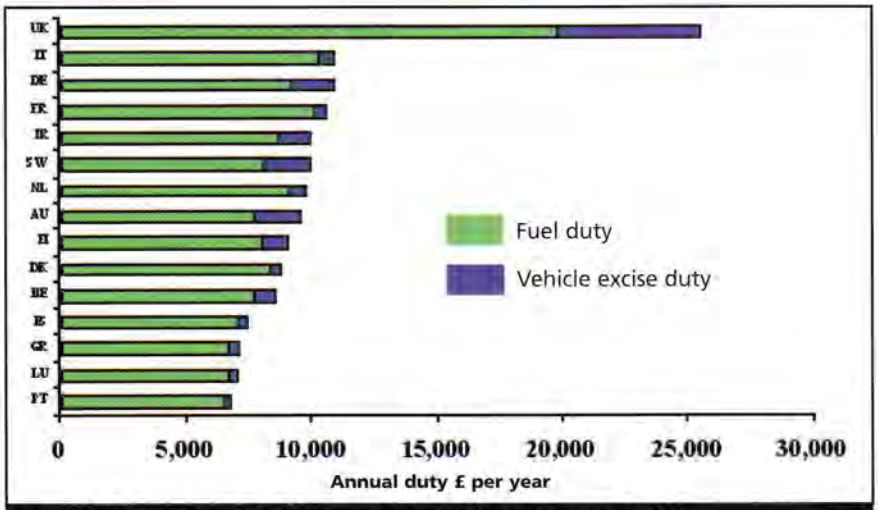


Figure 1: Average annual fuel duty and VED. Paid by a 40t gtw artic:1999

	UK	France	Belgium	Netherlands
Total operating costs (in £)	85,738	77,053	83,204	79,418
Index (UK=100)	100	90	97	93

Source: FTA

Table 1: Comparative operating costs for 40-tonne gross vehicle weight (2+3) articulated vehicles operated in the UK

Studies conducted by the UK's Road Haulage Forum show that this has resulted in UK operators now finding themselves at a clear cost disadvantage compared to their foreign competitors – even when lower employer social contributions in the UK are taken into consideration.

Furthermore, in reality it is unlikely that we have finally seen the back of above inflation increases in fuel duty. In the same breath as ending the fuel duty escalator, the Chancellor also announced that new investment in transport infrastructure would be met from a ring-fenced fund raised from any future real increases in fuel duty. There is every likelihood that UK Transport Minister John Prescott will seize the opportunity of the March 2000 Budget to kick start his 10-year transport investment plan with this new revenue stream, rather than having to take his chance with other departments in the government's current comprehensive spending review.

Reducing the burden

The Chancellor's actions in this, and future, Budgets need to be directed towards reducing the overall tax burden on goods vehicle operators. There are several measures by which this could be achieved:

Vehicle excise duty

An immediate way of reducing overall tax burden on industry would be to reduce the rates of vehicle excise duty for lorries. This is a particular issue for operators of 40-tonne, 5-axled vehicles. The VED rate for such units was increased to £5,750 at the last Budget. This is 12 times the level for the same vehicle in France and seven times that in Belgium. These vehicles are of the type most widely used by continental operators entering this country on an international journey.

Reductions in VED rates to offset fuel duty increases (see **Table 2**) would not be sufficiently large to compensate all vehicle operators. But the reductions that could be made for multi-axled articulated vehicles would particularly benefit those hauliers who are most vulnerable to lower-taxed, foreign competition and who have been the hardest hit by recent tax increases.

However adjusting VED rates to offset the burden of higher diesel duty can only be a stop-gap measure. Even a significant reduction in VED rates would go only part way to tackling the disparities in taxation that UK operators face compared to their European competitors.

In any event VED remains the government's principal fiscal mechanism for influencing the make-up and environmental standards of the UK goods vehicle stock. The availability of VED refunds to encourage the fitment of particulate traps is already encouraging operators to introduce measures to improve air quality. But for the scheme to be successful, the level of rebates permitted needs to be increased. The current maximum rebate of £1,000/y gives a pay-back period for operators fitting a particulate trap of five years. With an increasing number of operators working their vehicles harder and replacing their vehicles sooner, the rebates need to be increase to closer to £1,500/y. Significantly paring back the standard rates of heavy goods vehicles', VED would require a new means of incentivising environmental improvements to be found.

HGV type	VED reduction per 1% increase in fuel	Current VED rate (£)
17-tonne gvw, 2-axle rigid	74	1,320
26-tonne gvw, 3-axle rigid	107	2,340
32-tonne gvw, 4-axle rigid	107	4,400
33-tonne gtw, 4-axle (2+2) artic	143	2,530
38-tonne gtw, 5-axle (2+3) artic	193	3,210
40-tonne gtw, 5-axle (2+3) artic	198	5,750

Source: FTA's Manager's Guide to Distribution Costs

Table 2: Reductions in VED necessary to compensate for any increases in fuel duty rate

Separate fuel duty rates for commercial vehicles

The adverse effects of the fuel duty escalator on the industry have arisen because industrial users of diesel fuel have been subject to the same taxation policies and rates as drivers of private motor cars.

In order to reduce the tax burden on the UK haulage industry resulting from the fuel duty escalator, the government needs to be able to set different duty rates for diesel fuel used in commercial vehicles and in cars. FTA has proposed, and is actively pursuing, a number of mechanisms with government in order to achieve this. These include:

- The creation of a separate fuel channel for diesel intended for commercial use and attracting a lower level of duty.
- A rebate on the standard diesel duty rate controlled through the use of fuel cards.
- A rebate on the standard diesel duty rate claimed through Inland Revenue/HM Customs and Excise as a deductible business expense, supported with receipted invoices or other appropriate fuel transactions.

All eyes are now on what the Chancellor does. What he says in this year's Budget is likely to have a significant bearing on how much industry will be paying for it's road diesel in years to come.

* *FTA represents the interests of 11,500 member companies, which are responsible for running 200,000 heavy goods vehicles (HGVs) – half of all HGV's operated in the UK. The association successfully campaigned for the ending of the fuel duty escalator in the 2H1999.*

** *This article was written before the March 2000 Budget was announced as* Petroleum Review *went to press. We will summarise the impact of the Budget statement in the May issue of the magazine.*

One hundred year history of design

Maurice Acton,
Chairman of forecourt design company MTA Design, **provides a 'potted history' of the development of service stations and their design.**

At the turn of the century, gasoline was sold in cans and from barrels in blacksmiths' shops and hardware stores. Some horse-drawn tanks also made housecalls. The first major change was the introduction of 'Bowser' pumps in the early years of this century – initially located off the road in yards – which offered better and safer fuelling. One of Bowser's first customers, a grocer named Gumper, subsequently jointed the Bowser Corporation and coined the term 'filling station' to describe the Bowser pump and its adjacent tank housing.

Underground tanks were introduced in 1902, and the first full-stroke pumps – which allowed for five or 10-gallon continuous delivery – emerged in 1904. In 1907, the first 'drive-through' filling station was opened in Seattle for Standard Oil of California. In 1910, the site glass was introduced on pumps, allowing the customer to view the fuel as it was being dispensed. This was followed in 1912 by a light globe on the pump top, which became a standard for branding the pumps until the 1970s.

From 1912 to 1920 roadside pumps became commonplace. The introduction of the very tall gravity pumps in 1917, combined with the lighting globe, gave visual prominence to these filling stations. At this time, most sites were dealer owned and there was very little understanding or presence of branding. By 1923 the first motor-driven pumps – measuring volume and price – were introduced. A whole series of pump and dispenser design improvements eventually led to the self-serve digital console controlled pumps of the 1970s.

The first true petrol station for storing and pumping gasoline was built in New York in 1901, followed by a chain of similar stations in the Boston area later that year. By the outbreak of WW1 petrol stations were becoming commonplace in the US. They were even being constructed as metal prefabricated structures by Standard Oil of Ohio as early as 1913 (the first installation was in Columbus).

As demand soared and more and more companies chased the lucrative petrol retailing market, the need for differentiation became the key element to increasing sales. Branding and signage started to appear during this period, but it was ad-hoc and disorganised.

The Golden Age

In the period from 1916 to the 1930s – the 'Golden Age' of petrol stations – dealers and oil companies turned to architecture as their major differentiator and an enormous range of architectural styles advertising individual stations or company operations developed. An excellent example of this was the Wadham's Oil Company trend of Milwaukee which introduced a new design in 1917 based on a Japanese tea house style. A considerable number of these stations were built and heralded a new age of architectural splendour in service station design.

As the number of cars increased dramatically from 1920 onwards, so did the number of filling stations. In the US in 1921, there were 12,000 drive-in stations, increasing to nearly 150,000 in the following nine years. At the beginning of this period about 50% of all petrol was purchased through hardware and general stores. By 1930, these had almost totally ceased as distributors.

Between 1920 and 1930 petrol stations evolved from just 'filling stations' to attractive and well-equipped 'service stations'. Oil companies were developing early standards of design, although this was on a local basis and not nationally or internationally rationalised. Companies were also producing prefabricated steel roadside buildings with canopy 'crackerboxes' to speed up the process of coping with increasing demand. In 1920 Shell, for example, built 100 service stations in six weeks on one stretch of highway in California.

By the early 1930s, despite the recession, there was a trend in the US for 'super service stations' which has recently seen a revival in world markets as oil companies rationalise their networks.

WW2 brought austerity and the golden age of petrol stations gave way to a more industrial approach to service station design in the 1940s. The oil companies were by then rationalising their approach and strong graphic branding was introduced and applied to whole networks in a consistent and organised manner. This new branding through colour and signage was the means by which oil companies differentiated themselves, having lost the architectural differentiation of the 1920s and 1930s. This was the birth of the service station as we know it today.

Self-service was introduced by Frank Urich in Los Angeles in 1947. But the concept didn't catch on quickly and by 1961 only 16% of US service stations were self-service. This increased dramatically after the petrol shortages of 1973/74 to 35% by 1975 and 80% by 1987. This rapid increase was enabled by the perfection of remote control automated pumps in the mid-1960s.

Integrated design concept

The first successful attempt to truly integrate all aspects of the service station into one design concept was made by architect Elliot Noyes in 1964. Working together with the graphic designers Chermayeff & Geismar, Noyes developed an innovative design for Mobil which made use of circular architecture for the forecourt canopies which was reflected in other elements of the station, such as the pumps, to create an interesting, bright and spacious image.

However, I would claim that the first truly integrated service station design came with the BP Horizon re-imaging programme in 1987 – which created a strong, stylish branding statement for the company both nationally and internationally. Not only did this represent a change in the visual sense, the project also went on to influence the signage industry as a whole – an approach to design and implementation that was carried through with the Shell worldwide re-imaging project where use was made of car manufacturing techniques in order to mass produce components more quickly and cost-effectively.

History in the making

Helen Jones recently completed her MA thesis on the history of petrol station design at the Royal College of Art. Here, she outlines how forecourts were originally conceived and highlights a recent initiative aimed at getting the general public to look at such sites in a new light.

Esso site at Leamouth Road.
Nearest station: East India Docklands Light Railway
Unlike the other oil majors Esso has not rebranded its network of service stations for a number of years. This station, with its convex curved roof, remains dominated by the company's well-known horizontal red stripe of the canopy fascia. The pylon-like structure of the main Esso sign relates to the surrounding industrial landscape and competes for the driver's attention with the Allen Jones sculpture in the centre of the roundabout.

Chinese Garage, Stone Park Avenue. Nearest station: Beckenham
The so-called Chinese garage, with its Japanese lanterns and oriental garden, is perhaps the most unusual petrol station in Britain. The exotic influence came from the local 'Lord of the Manor' who had spent some years in Japan and incorporated many Japanese motifs into the Park Langley area, such as the lantern-like post boxes. The garage, built in 1929, was actually designed not to stand out from its surroundings, but rather to blend in. Vernacular references, such as the mock-Tudor detailing refer to the facing domestic buildings. It is a popular landmark and is now a listed building.

Petrol stations, as the most ubiquitous element of our roadside landscape, may be seen as the building type that has had the most significant impact upon our everyday environment. As the defining machine of the 20th century, the motor car has played a central role in the modernisation of our daily lives. The car demands more than roads on which to travel, it requires places to refuel, buildings in which to be repaired and garages in which to park.

These new environments represent a fascinating range of roadside structures. Yet, the history of their development, in particular the evolution of the petrol station, which should be central to the recorded history of 20th century architecture, have in the main been ignored by historians. With the notable exception of Trevor Lord's unpublished thesis and David Jeremiah's essay on roadside pumps, surprisingly little has been written on the subject of petrol stations in the UK. In the US, however, the situation is different. Dan Vieyra produced *Fill er Up*, the first architectural history of gas stations, which has since been followed by a number of publications, most notably John Margolie's *Pump and Circumstance*.

Many of the world's best known architects – from Frank Lloyd Wright to Robert Venturi and Lord Foster – have all had a go at designing service stations. In fact it was the pioneering American industrial designers Henry Dreyfuss, Raymond Loewy, Walter Dorwin Teague and Eliot Noyes who first established the kit-like formula that defines modern day sites across the globe. Their idea was to employ design to package petroleum, using the entire service station as a vehicle for the promotion of company identity. Artists too, have appreciated the imagery associated with petrol stations. Perhaps the best known is Edward Hopper, whose paintings include *Gas* (1940).

Packaging petrol

Since their foundation, oil companies have felt the need to differentiate themselves and their fuels through the medium of design. Corporate image was (and remains) central to the system of retailing petrol.

The packaging of petrol, a dangerous substance which has few desirable qualities except that it facilitates transportation, and with which the consumer desires to have as little contact as possible, has always been difficult. Indeed, in marketing terms, petrol is described as a 'distress purchase' or a 'no-added-value' product. Packaging historian Thomas Hine recognised that: 'The challenge for the oil companies was to brand their products without using a package.'

Bloomsbury service station, Store Street Garage. Nearest tube: Goodge Street
Bloomsbury service station is the oldest operational petrol station in central London. Established as the Duke of Bedford's private garage, it has been in continual operation since 1926. The present owner of the domestic scale petrol station has maintained its Art Deco references and researched the original sky blue paint colour.

Methods for differentiating or branding petrol have changed only slightly during the entire history of the oil industry. In the first half of the 20th-century the packaging ranged from corporate motifs and colour schemes applied to the initial form of retailing petrol, the two-gallon can. As cars and the roads on which they

continued on p33...

Texaco site at Earls Court Road. Nearest tube: High Street Kensington
The dramatic structure of this station with its reinforced-concrete, glass filled canopy makes it a local favourite. This petrol station was originally owned by the Regent oil company, the precursor of Texaco in the UK. Since 1968 it has operated as a Texaco petrol station.

How to avoid getting bogged down

Shell Canada's C$3.5bn Muskeg River Mine is Canada's first new major oil sands development in over two decades. However, the company is discovering that quite a bit has changed in the intervening years, writes *Gordon Cope*.

In December 1999, Shell Canada (60%), together with partners Chevron Canada Resources and Western Oil Sands (20% each), announced the start of the construction of the C$3.5bn Athabasca Oil Sands Project in Northern Alberta. The project is centred around a massive deposit of oil sand located 70 km north of Fort McMurray. The Muskeg River lease – operated by a new company, Albian Sands Energy – contains in excess of 5bn barrels of mineable bitumen (twice the amount of conventional oil reserves remaining in Alberta). Production is slated for 155,000 b/d when the C$1.7bn mine reaches full capacity in late 2002.

The project also includes a C$1.7bn upgrader to be constructed next to Shell's existing Scotford refinery in Fort Saskatchewan, Alberta (which is near Edmonton). The upgrader, operated by Shell, will process the bitumen into a range of premium, synthetic crude oils. These synthetic crude oils will be sold to Shell's Scotford and Sarnia refineries, and Chevron's Salt Lake and Burnaby refineries. The balance will be sold to other refiners.

In addition, BC Gas will build and operate a dedicated pipeline. The C$600mn Corridor pipeline will transport diluted bitumen the 400 km between the mine and the upgrader.

A crude incentive

The immense investment on oil sands is based on two rationales; declining conventional reserves and profitability. Much of Canada's conventional oil was discovered in the late 1940s and early 1950s with the delineation of prolific Devonian reef fields. Since then, the basin has matured and major oil companies are no longer able to easily replace reserves with large finds.

On the other hand, the basin contains a gargantuan non-conventional resource in the form of oil sands – deposits of bitumen (petroleum in the solid or semi-solid state) mixed with unconsolidated sand. The Canadian Association of Petroleum Producers (CAPP) estimates that the oil sands region in Alberta contains 300bn barrels of recoverable oil, out of total reserves of 2.5tn barrels.

The total production of synthetic crude from the Syncrude oil consortium, located near Fort McMurray, Alberta, and the nearby Suncor Energy plant averaged almost 330,000 b/d in 1998. That figure is about to expand dramatically as an estimated C$30–$35bn is invested in the region. 'Right now, Athabasca oil sands produce 25% of the country's oil production,' says Rob Seeley, Manager of Regulatory Affairs for Shell's oil sands division. 'We see the region producing 50% of Canada's oil needs by 2010, approximately 1mn barrels of synthetic crude and bitumen.'

In addition to Shell; the following projects have been announced:

- Syncrude Canada has earmarked in excess of C$3bn to boost total production to at least 425,000 b/d by 2006.
- Suncor Energy is looking to spend over C$2bn to double output at its Steepbank mine to 210,000 b/d by 2002.
- Mobil Canada unveiled a C$2.5bn oil sands project. Scheduled for completion in 2003, the Kearl mine and extraction plant will have a capacity of 100,000 b/d.

Such huge sums are being invested because of the expectation that profits on oil sands production will be higher than conventional exploration. 'When you look at Muskeg River over the life of the project, you've got a rate-of-return that's north of 20%, says Paul McGarvey, an Oil and Gas Analyst with Newcrest Capital. 'When you compare it with conventional oil, that's outstanding.'

What a difference a decade makes

But even the most stellar rate-of-return no longer guarantees a 'go' from head office. The Suncor operation was built in the 1960s, and Syncrude came onstream in 1978. Over the intervening years, environmental regulations, non-governmental organisations (NGOs) and community action groups have staked their place at the development table. Giant oil companies, such as Shell International (the majority shareholder of Shell Canada), have had to create development plans that include considerations ranging far beyond the economic.

'Every new development has to meet Shell International's standard test of sustainable development,' says Seeley. 'It has to be sustainable economically, socially and environmentally. If it doesn't work on all three levels, then there's no project.'

In the case of the environment, awareness regarding oil sands projects has focused on both the local and global impact. 'We're allowing dramatic expansion of output without establishing a framework to protect the environment,' says Tom Marr-Laing, the Manager of the oil sands group for the Pembina Institute for Appropriate Development, a non-profit environmental watchdog. 'We're taking a substantial risk.'

Local Aboriginal communities are also effected by the development. The tiny Fort MacKay First Nation community sits right on top of the richest oil sands and is surrounded by developments, including Shell's Muskeg River Mine a mere 3 km away. 'Our way of living has sustained us for thousands of years,' says Jim Boucher, Chief of the Fort MacKay First Nation band and President of the Athabasca Tribal Corporation. 'But now there is a huge number of people coming into our area. Can we sustain the moose, and geese and fishing?'

Hunting for a new approach

In order to achieve maximum efficiency and minimum environmental impact, Shell has designed the new project around the latest mining, transport and

refining techniques. 'A lot of technologies were developed by Suncor and Syncrude, and we have an opportunity to start from scratch,' explains Seeley. 'Back in 1980, operating costs (for oil sands) were around $24/b. Now, it's around $10-$12/b.'

When the original mining operations were built, they relied on immense bucket-wheels and conveyor belts. Unfortunately, the expensive equipment could not deal with the fact that oil sands, like many types of ore deposits, are not homogenous. 'Oil sand deposits come in layers, ranging from hi-grade to low-grade,' says Seeley. As a result, the bucket-wheel/conveyor systems sent much low-grade gravel to the extraction plant. 'It took a lot of energy to remove the waste.'

The Muskeg River mine has eliminated bucket-wheels and conveyor belts. 'Now, we use 320-tonne trucks and 100-tonne shovels,' says Seeley. 'We'll be able to mine the high-grade bitumen in benched layers – there will be no waste going to the extraction plant.'

Significant advances have also been made in extraction. 'There are four degrees of freedom to bitumen extraction: thermal energy, mechanical energy, chemical energy and residue time,' notes Seeley. 'We've removed chemical energy – we use caustic-free extraction.'

Shell's oil sands will go through three extraction steps: primary extraction, froth treatment and solvent recovery. 'In primary extraction, bitumen is removed from sand at low temperature (35°C vs 75°C), says Seeley. 'The removed bitumen comes out as a black froth; 40% bitumen, 30% clay and 30% water. The older method used centrifuges to remove the water and clay, essentially, it spun them out. We use a counter-current, paraffinic-froth treatment.'

A light hydrocarbon, like pentane, is streamed in opposite direction against the froth. 'The solvent absorbs the hydrocarbon and you end up with a higher-grade bitumen with very little clay and water. It uses a lot less energy than a centrifuge – it's just a couple of tanks and paddles.'

The solvent-laden bitumen is then pumped to the upgrader in Fort Saskatchewan. The traditional bitumen upgraders, or cokers, are expensive to build. A 100,000 b/d unit can cost $18,000 or more per barrel capacity. Shell will be relying on new technology and industrial synergy to keep costs down to the $11,000/b capacity range. 'Our upgrader will be situated beside our existing refinery, which will be a significant advantage,' says Seeley. 'There are some also some waste gas streams (from nearby industries) that are of use to us.'

The upgrader will use hydro-conversion to upgrade bitumen to synthetic crude. 'We will bombard the long hydrocarbon chains with hydrogen,' says Seeley. 'You put 100 barrels of bitumen in, and get 102 barrels of synthetic crude out.'

The low-aromatic, plus low sulphur output is in high demand as a blending stock. 'Coking techniques create aromatic rings, which end up as (carcinogenic) toluene and benzene in gasoline,' says Seeley. 'Our synthetic will be valuable in meeting new specs.'

A breath of fresh air

Since the last oil sands project was built in the late 1970s, general awareness of the regional and global environmental effects of large scale projects has increased dramatically. 'All of these new projects create tremendous problems in protecting the environment,' says the Pembina Institute's Marr-Laing.

Natural Resources Canada predicts that Canadian greenhouse gas emissions will be about 45 megatonnes higher in 2010 than predicted. Oil sands projects may account for 27 megatonnes, or 60% of the emissions growth. 'It's going to be the single largest contributor to us missing our Kyoto target,' comments Marr-Laing.

Shell calculates that the Athabasca Oil Sands Project, in its current design, will emit 3.5mn t/y of carbon dioxide in direct emissions, plus emissions associated with purchased power – a reduction of over 25% from the design case approved by the Alberta Energy and Utilities Board in February 1999. 'The initial goal is to reduce/offset emissions by a further 1.4mn t/y by 2010, which is a reduction of 40% based on the current expected production,' notes Shell spokesperson Patty Richards. 'This will bring the project's emissions in line with those of the average of all imported crudes coming into North America.'

Other environmental concerns focus around regional pollution, such as acidification of air, water and soil. The Wood Buffalo Environmental Association is a multi-stakeholder group set up in 1997 to monitor the environment in the Fort McMurray area. The 17-member organisation includes participants from industry, the provincial government, Aboriginal groups and forestry. 'We have two mandates, to collect credible scientific information and to openly communicate to the

public and stakeholders,' says Bob Scotten, the Chairman and Executive Director.

The WBEA has eight air monitoring stations that measure a dozen factors, including SO_2, H_2S, ozone, total hydrocarbons and particulates. It also measures the effects of oil sands effluents on soil, plant life and animal life. 'If there is ground level exceedence of government guidelines, we report it to the provincial government,' says Scotten. 'They then have to make repairs and/or eliminate the source.'

Shell has been in consultation with the WBEA since 1997, when it first decided to go ahead with the Muskeg River development. 'Shell has fitted right in, and we're delighted,' says Scotten. 'It's nice to see their way of doing business.'

Environmentalists are also concerned about waste products directly associated with the mining process, such as sand and tailing pond water. Syncrude alone has a 15 sq km storage pit for sand, and a 5 sq km tailings lake for waste water. 'Our extraction process has higher settling rates and higher water re-use', says Shell's Seeley. 'The old methods required big tailings ponds. Ours will be one-third the size.'

As for waste sand, it will initially be used to build tailing dykes and the water reservoir. 'After five or six years, we'll have a pit, and all the sand will go back into the pit. We'll have phased reclamation in which the site will be reclaimed fully to a dry landscape.'

Smoking the peace pipe

The population of Wood Buffalo region is 45,000; approximately 6,300 of them are Aboriginal. 'Over the last 30 years, there's been quite a few snags,' comments Chief Jim Boucher. 'Ten years ago, Aboriginals were less than 3% of the workforce. They were last to be hired, and first to be fired.' Over the last decade, however, opportunities for the Aboriginal groups began to improve. 'We formed a working committee with Fort MacKay in 1997 to forward concerns,' says Shell's Seeley. 'We dealt with socio-economic and environmental issues and worked them through. The socio-economic agreement deals with opportunities for business, education, jobs and the retention of culture.'

'Syncrude has made a substantial commitment to hire 13% of the workforce, and Shell has made a similar commitment,' says Boucher. 'Syncrude also does $60–$70mn of business with Aboriginals, and right off the bat, Shell said they had a commitment to our communities.'

Bagging your quarry

Over its 30-year life, the Athabasca Oil Sands Project is slated to recover 1.65bn barrels of bitumen. It will employ approximately 1,000 Albertan and Aboriginal people, and contribute over $5bn in the form of taxes and royalties, to all levels of government.

'It has been hugely rewarding to create a project that's best-in-class,' says Seeley. 'It will promote sustainable development not only to Shell, but to the local community. It helps to move the industry forward.'

Regardless of their efforts, however, Shell is fully aware that its commitment to the community and environment will never cease. 'Some companies have been making efforts to improve emissions of plants, but their greenhouse gas target of having an equivalent to the average of all conventional oil coming into North America is just business-as-usual,' says the Pembina Institute's Marr-Laing. 'They need to be much more aggressive.'

At what point does this area become saturated, and we can no longer live as we are accustomed to?' asks Chief Boucher. 'We will engage ourselves in the process, and (if our way of life is negatively impacted) we will communicate that.'

... continued from p30

travelled increased in number, so did the need for fuel supplies and the can was quickly replaced by the roadside petrol pump.

Pumps were placed outside existing businesses, ranging from the chemists to the bicycle repair shops and the new motor-car garages. It was only a matter of time before the filling station proper became a reassuring place for motorists to refuel. For much of the mid-20th century sites sold various brands of petrol, identified by glass globes which crowned the top of the pumps. The earliest chain of petrol stations in the UK existed as a privilege of AA membership – the first 10 such sites opened in Aldermaston in 1920. From the records I have researched to date, the first public petrol station in London seems to have been the Pratts owned site by Battersea Park, which, sadly, is no longer there. Indeed, finding operational petrol stations prior to World War II is increasingly rare.

US precedent

The precedent for modern day service stations, each identifiable as a particular brand, was established in the US. Chains of look-a-like stations sprung up across the States. Some in the suburbs were even made in the English country cottage style. In the Twenties the Pure Oil Company standardised its chain of house-like stations and Phillips Petroleum Company opened its first English cottage station in Wichita, Kansas.

The cottage, with its domestic architectural scale and language, was believed to be more sensitive to its environment, but more importantly, was used as a promotional device to differentiate one brand from another.

In the second half of the century the petrol station itself has, in its totality, become a potent symbol of corporate identity. Hence, Robert Venturi's observation: the 'buildings are small and cheap, the signs are big and expensive.'

New look initiative

'It's a Gas' is a collaborative project between photographer Andrew Cross, designer Nina Berkowitz and myself, the aim of which is to generate interest in the petrol station as an important element of 20th-century design. The result is a pocket-sized leaflet – produced for the Arts Council Architecture Week initiative in November 1999 and sponsored by petrol station design consultancy MTA Design – which highlights seven of the most architecturally and culturally interesting petrol stations in greater London.

Public transport is used to take the 'It's a Gas' journey around the selected sites. When a motorist arrives at a petrol station by car, the site is experienced as it was meant to be encountered – at speed. We found that by encouraging people to make a journey by bus and tube to look at a specific petrol station they were better able to study the design of the structures and spend time considering the identity of the sites.

The subject has proved popular and articles about petrol station design have been recently featured in a diverse range of publications, including *The Telegraph, The Guardian, Building Design, Top Gear* and the *British Journal of Archaeology*. The topic has also received recent radio coverage.

To visit the selected sites yourself – a few of which are highlighted on these pages (photos © Andrew Cross) – contact Di Ollah at MTA Design on Tel: +44 (0)20 7171 967 1130.

Setting sights on subsea development

Significant growth is expected in the subsea sector over the next five years, with a total of 1,257 completions predicted by 2005. *Paul Hillegeist*, Chief Executive Officer, Quest Offshore Resources, outlines the findings of the company's most recent survey of global subsea prospects.*

As illustrated in **Figure 1**, the subsea sector has experienced remarkable growth over the last 30 years – a trend that looks set to continue. Quest's Subsea-Data-Base projects an 87% growth rate in subsea activity over the next five-plus years, with an average of 210 subsea completions forecast per year compared with an average of 122 completions per year from 1995-99.

Most significantly perhaps are the water depth gains pioneered with subsea technology. The average water depths for subsea installations have increased exponentially over the last decade, from an average of 124 msw (metres sea water depth) in 1989 to more than 350 msw in 1999. This growth into deeper water is expected to continue and is forecast to reach an average of 530 msw over the next five years.

Lookin at a a regional perspective, see **Figure 2**, the most dramatic growth in subsea activity is in Africa, with 331 subsea completions forecast to be installed over the next five years (see also **Figures 3** and **4**). This represents a monumental 250% increase over the historical activity in the region from 1962 to 1999 to 124 total completions. These 331 planned, probable and possible tree orders represent plans for the 28 projects currently identified. Angola is by far the most active country on the African continent with 13 deepwater projects forecast calling for over 200 xmas trees. It is followed by Nigeria, with over 60 trees forecast for Shell's Bonga and Texaco's Agbami developments and numerous others projected to materialize.

The mature regions of the Gulf of Mexico and Brazil are also predicted to experience a continued healthy pace of activity – albeit at slower rate of growth than in the past. A total of 65 projects have been identified in the Gulf of Mexico/Canada NE, comprising of 183 trees. Brazil is expected to experience a continued high pace of activity with 240 completions identified, representing an average of 40 trees per year. The North Sea, particularly Norway, will also continue to play an important role for subsea suppliers, with a balanced number of projects in the UK.

Growth of horizontal trees

An analysis of completions by classification indicates widespread use of horizontal trees (HT) in recent years. As illustrated in **Table 1**, only 4% of completions from 1990 to 1994 were horizontal compared with a majority of conventional trees (CT). There was dramatic growth in the number of horizontal trees from 1995-99, with HT trees having a 13% share of the total market. Moreover, in the deepwater sector over 1,000 fsw (feet sea water depth), horizontal trees comprised an impressive 18.8% of the market during 1995-99.

A total of 27 trees, or 54%, of the identified deepwater market (over 1,000 fsw) are earmarked for HT development in 2000. Examples of where widespread use of horizontal trees have been made to date include Chevron on its Angolan Kuito field (see *Petroleum Review*, April 2000) (trees supplied by ABB) and ExxonMobil on Diana in the Gulf of Mexico (trees manufactured by FMC), and also by Shell on its Malampaya project in the Philippines (units fabricated by Cameron).

Africa

Africa is one of the most important regions for exponential growth in the ultra-deepwater and subsea sector. Angola is by far the most active country for deepwater activity (see *Petroleum Review*, April 2000) with some significant recent deepwater discoveries offshore Nigeria.

In January, Chevron commenced first production from phase one of Kuito on block 14 Kuito – Angola's first deepwater and zero-flare field. The project was achieved under budget and just

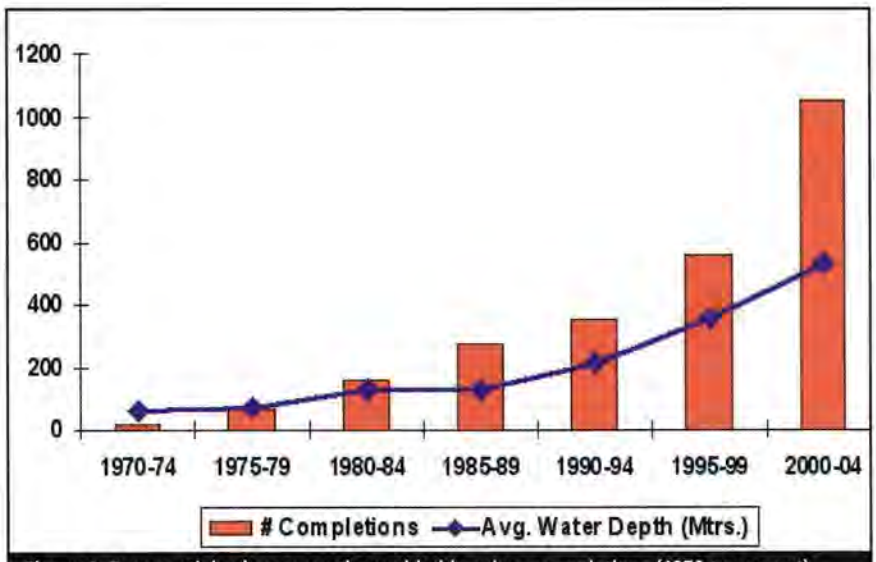


Figure 1: Exponential subsea growth, worldwide subsea completions (1970 to present)
Source: Quest SUBSEA-DATA-BASE

two and a half years after discovery. The consortium leader Single Buoy Moorings (SBM) and partners Coflexip Stena Offshore (CSO) and ABB Offshore Systems were responsible for turnkey fabrication and installation of Kuito facilities. CSO's workscope for Kuito Phase 1A included the design, engineering, supply and installation of 20 km of flexible flowlines and risers, together with 15 km of umbilicals, using its flexible reel ship *CSO Installer* and chartered vessel *Smit Pioneer*.

CSO also installed a range of subsea equipment including a 12-slot production manifold. SBM and ABB Offshore Systems supplied the FPSO and subsea equipment, respectively. ABB's workscope included the engineering and fabrication of 12 horizontal production trees, one gas injection tree and a production manifold. Wells were drilled and completed by *Transocean Sedco* Forex's *Sedco 708*. There are presently two other phases in progress – Kuito Phase IB comprising eight water injection trees for installation in mid-2000, and Kuito IC with 10 or 12 production trees planned for a later date.

Activity off Angola block 17 is well established with Elf's 40-plus well Girassol subsea development in progress for installation in 2001. Mer Profounde Girassol is the prime contractor for the multi-billion project in 1,350 msw. Elsewhere, the subsea well count for Elf's Dalia project on block 17 is on the rise. Elf is proposing 40 wells – 20 producers and 20 injection – for Dalia, but in fact these are just the template wells. There is another group of satellite wells that bring the total up to 59 as approved at a partner meeting in late-December 1999. Bid tenders are slated for June 2000, with contract awards anticipated by the end of the year.

Nearby, on Angola's block 15, – Halliburton's Brown & Root subsidiary won ExxonMobil's Kizombo front-end engineering design (FEED) contract – valued at approximately $25mn – based on an FPSO and floating wellhead platform wet and dry trees centered around development of the Hungo and Chocalho fields in 1,200 msw. The second phase of Kizombo – centered around development of Kissanje, Dikanza, Marimba and Xikomba – is likely to include a second wellhead platform (spar or tension leg platform) and subsea satellites, or a stand-alone subsea alternative tied-back to the FPSO.

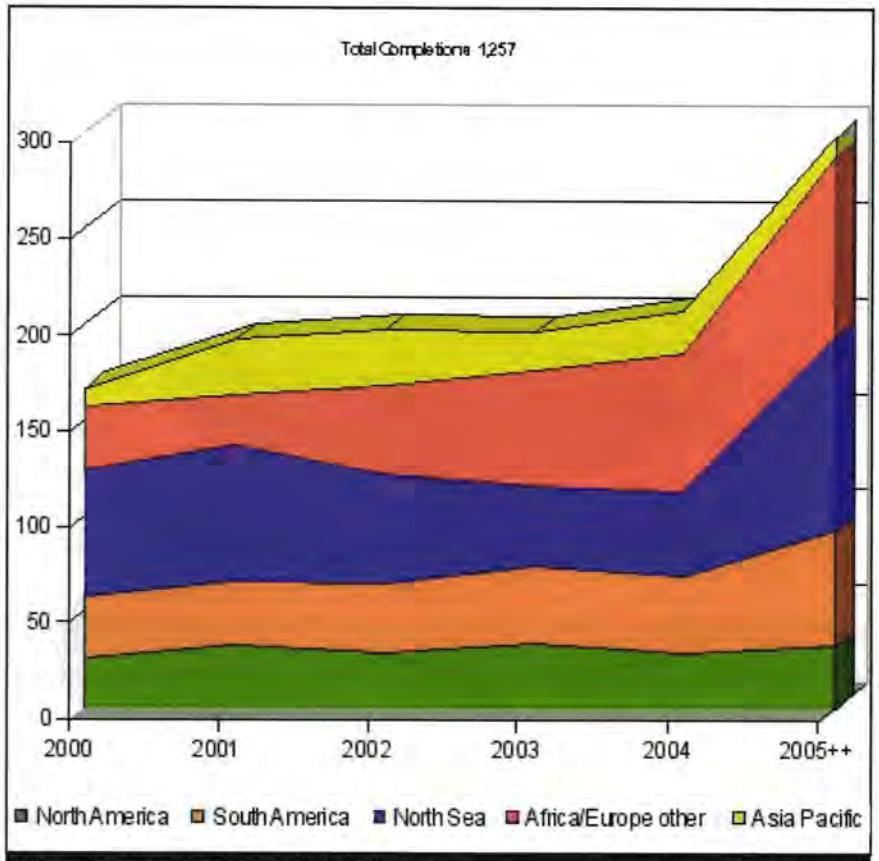


Figure 2: Forecast subsea completions by area *Source: Quest SUBSEA-DATA-BASE*

With a string of recent discoveries, deepwater activity offshore Nigeria has increased. Texaco recently hiked reserve estimates offshore Nigeria at its deepwater Agbami prospect. The company's Agbami-2 appraisal well, drilled with drillship *Glomar Explorer* on OPL 216 in 4,800 fsw, confirmed that the Agbami structure is a giant discovery with potential recoverable reserves in excess of 1bn boe.

Tests suggest that the Agbami discovery ranks among the largest single finds to date in deepwater West Africa. The successful conclusion of well tests sets the stage for development of a world class project that will add substantially to Texaco's resource base and significantly increase the company's future production. The operator envisions a spar or tension leg platform (TLP) development in conjunction with an FPSO and subsea scheme with up to 20 completions. The project is expected to come onstream in 2003.

Contractors are also vying for a piece of Shell's multi-billion dollar Bonga project offshore Nigeria. Daewoo and Samsung are contenders for fabrication of the FPSO hull. Heerema has pre-qualified for the pipeline and flowline package and will propose its patented J-Lay system aboard SSCV's *Balder*, *Thialf* or *Hermod*. Other competitors for the pipeline and flowline package are CSO, Stolt Offshore/ETPM, J Ray McDermott, DSND, Brown & Root/ Allseas and Saibos.

Other bright spots offshore West Africa include Equatorial Guinea where subsea activity has quickly heated-up with Triton's 1999 discovery well on block G. Dallas-based Triton Energy awarded contracts associated with the fast-track development of its Ceiba field on block G in 2,347 fsw. Triton has also moved up its ambitious development schedule and is targeting first oil production by year-end 2000.

	1990–94				1995–99				2000e			
	CT	HT	HT % of TOT	Total	CT	HT	HT % of TOT	Total	CT	HT	HT % of TOT	Total
To 1,000 fsw	272	15	5.2%	287	271	25	8.4%	296	115	1	0.9%	116
Over 1,000 fsw	63	0	0.0%	63	216	50	18.8%	266	23	27	54.0%	50
Total	335	15	4.3%	350	487	75	13.3%	562	138	28	16.9%	166

Table 1 *Source: Quest SUBSEA-DATA-BASE*

Use of horizontal trees versus conventional trees.

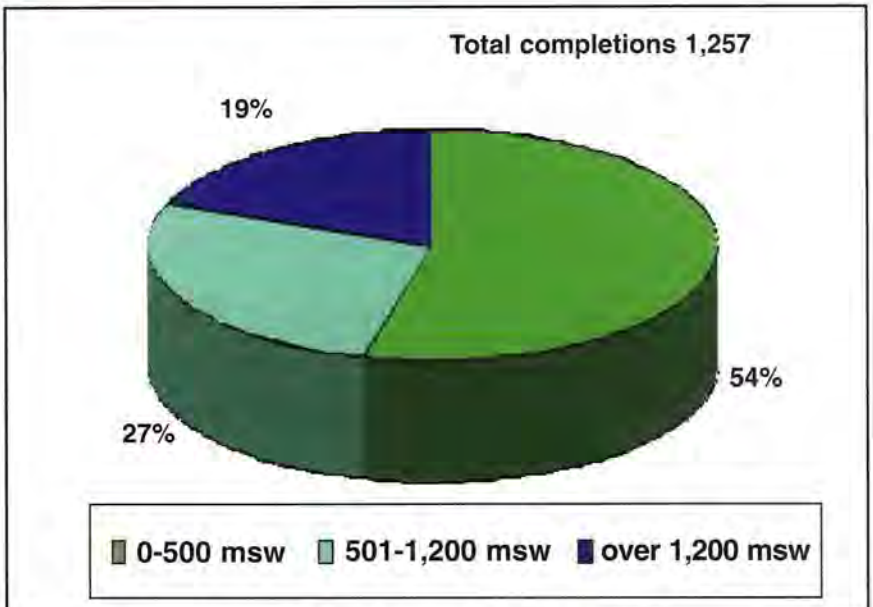


Figure 3: Forecast subsea completions by water depth 2000 to 2005++
Source: Quest SUBSEA-DATA-BASE

Bergesen of Norway will supply the Ceiba FPSO *Berge Charlotte* under a lease scenario. The unit's specifications provide for 2mn barrels of storage and initial processing capacity of 60,000 b/d of oil. Triton anticipates initial phase one production of 52,000 b/d, although the vessel can be expanded cost-effectively through the addition of incremental processing capacity to accommodate up to 240,000 b/d. Stolt Offshore was awarded subsea installation works including flowlines to the FPSO with the *Seaway Falcon, Seaway Kestrel, Seaway Eagle* or *Seaway Osprey*. Houston-based Cameron will supply its 'spool tree' hardware for the field's four subsea wellheads and trees. The Ceiba-1 discovery well and the Ceiba-2 appraisal well are scheduled for completion work in 2000 and will be two of the four planned producing wells. Drilling and completion of the remaining two appraisal/production wells will follow later in the year. Triton Energy envisions that the Ceiba field development on block G in 2,347 fsw will grow to a total of 30 subsea wells in the future.

Offshore Egypt, British Gas tapped Bechtel and Intec to spearhead its deepwater Scarab/Saffron development. British Gas awarded separate management contracts to Bechtel and Intec Engineering for development of the West Delta Deep concession in 1,740 fsw. Bechtel, who beat Kvaerner, Aker and Halliburton to secure the contract, will manage the onshore workscope. Intec Engineering is responsible for the offshore workscope including contractor selection.

A full-blown subsea scheme comprising eight-plus subsea completions is the preferred development solution which will produce to a subsea manifold in the field. Plans for an FPSO have been scrapped. A 52-mile, 30-inch or 36-inch diameter pipeline will be laid to shore. British Gas issued tenders in February 2000 for the 84-km umbilical linking the subsea field development scheme to shore. Offshore installation is scheduled for 2002-2003. The field is estimated to contain 4tn cf of recoverable gas reserves and is said to be Egypt's largest gas field discovered to date.

North America

US Gulf operators are increasingly stepping-out into deeper water and are looking to build infrastructure in frontier areas in the form of multiple floating platforms (mini-TLP or spars and, potentially, FPSOs) with subsea clusters tied-back. Quest Subsea-Data-Base forecasts 183 completions for North America over the next five to six years. Floaters are gaining momentum in ultra-deep waters.

BP Amoco has prioritised its near-term deepwater venue and has given a green light to the anticipated Holstein (GC 644), Mad Dog (GC 825) and the claimed 1bn-plus barrel Crazy Horse (MC 778) developments in the ultra-deepwater Gulf of Mexico from 1,300 to 2,052 msw. These developments are expected to incorporate floating platforms (spars or TLPs) in conjunction with subsea schemes.

Gulf Island Fabrication recently announced the creation of a new wholly-owned subsidiary based in Houston – Deep Ocean Services who will market and develop deepwater floating production platforms, including its proprietary MinDOC floater as well as mini-TLPs and spars, for this sector. The newly formed company also will provide project financing, bareboat charter leasing options and fabrication services for these concepts.

Many deepwater projects earmarked for potential floating concepts are gaining momentum, including Kerr-McGee's Boomvang (EBR 643/688 unit), Elf's Matterhorn (MC 243) and Vastar's Horn Mountain (MC 127) to name a few. Many of these projects are designed for 3,000-tonne to 4,000-tonne plus topsides, with fabrication tenders slated for mid-2000. Aker Engineering, Alliance Engineering and Atlantia Engineering are conducting separate front-end engineering design studies for floating platform concepts (spar or mini-TLP) to develop Vastar's 125mn barrel Horn Mountain prospect in Mississippi Canyon blocks 126 and 127 in 5,417 fsw. Elsewhere, Elf awarded the FEED contract for its Aconcagua prospect at Mississippi Canyon block 305 in 7,100 fsw to Intec Engineering of Houston.

In January, Kerr-McGee boosted reserves at its Nansen prospect, revealing enhanced field economics for the greater Boomvang and Nansen developments. The company upped reserve estimates for its Nansen discovery to 500–600bn cf of gas equivalent (from 350–450bn cfe) with its second successful appraisal well East Breaks 602 #3. Development scenarios for the entire East Breaks area are being evaluated with confirmed plans for one spar at the 100mn boe Boomvang and North Boomvang discoveries and another spar at Nansen, both of which will be prime hosts for future subsea satellite tie-backs. Development plans are expected to be finalised during Q12000, with initial production expected to begin in 2002.

Chevron issued contract awards for its $250mn deepwater Typhoon development at Green Canyon Block 237 in 731 msw. Atlantia Engineering will supply a 'Sea Star' mini-TLP, Cameron will supply four subsea wellheads and trees, ABB will supply four subsea controls, DUCO will supply umbilicals, and J Ray McDermott will fabricate the Sea Star hull and topsides as well as perform installation operations with derrick lay barge *DB 50*. The project is expected to come onstream in 2002.

South America

Offshore Brazil, Petrobras continues to establish records with an average of 35 to 40 subsea completions installed per year. The opening of the sector to outsiders is expected to ramp-up activity even more,

with ExxonMobil, Shell, Unocal and Texaco expected to be key players in this arena.

Halliburton recently secured the largest offshore EPIC project ever awarded to a single contractor and it is currently moving forward with Petrobras' $2.5bn integrated Barracuda (785 msw) and Caratinga (1,035 msw) projects in Brazil's Campos Basin. Both Halliburton Energy Services (HES) and Brown & Root Energy Services (BRES) business units will perform full engineering, procurement, installation and construction services. Workscope comprises construction of 51 wells, fabrication and installation of flowlines and risers, construction and installation of two FPSOs, and the commissioning, start-up and operation support for both fields. Each of the FPSOs have storage capacity of 2mn barrels with production capacity of 150,000 b/d. A minimum of 40% of the value of FPSOs' work is to be performed in Brazil.

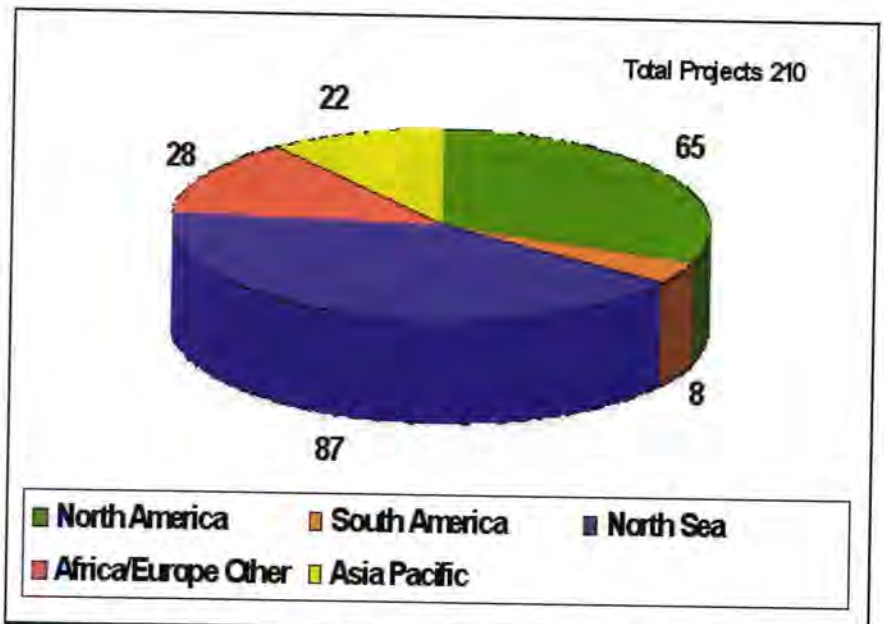


Figure 4: Forecast subsea projects by area

Source: Quest SUBSEA-DATA-BASE

Asia-Pacific

In the Asia-Pacific sector, 120 subsea completions are forecast with additional projects anticipated. Once the market for LNG is solidified, Australia's North West Shelf will be a beehive of subsea activity. Unocal has been active offshore Indonesia in the Makassar Strait production sharing contract area. Late last year, Pertamina granted Unocal (operator 50%) and Mobil (50%) approval to commence deepwater development activities in the deepwater Kutei Basin offshore East Kalimantan – Indonesia's first deepwater development.

The West Seno and Merah Besar projects mark a major milestone for Unocal, who is the most active explorer in Indonesia with about 2.5mn gross acres in the deepwater Kutei Basin alone – the equivalent of about 500 Gulf of Mexico blocks. The two-phase development scheme encompasses two mini-TLPs with tender assisted drilling at West Seno in 975 msw. Produced fluids will be processed on a single FPU nearby the first TLP. Oil and gas production will be transported to shore from the FPU via two separate (~14-inch or ~18-inch diameter) 60-km pipelines to the existing Santan terminal.

Prime contenders for the project's large diameter export pipelines will be limited to Global's DLB *Hercules*, Allseas' *Solitaire*, Saipem's *SSCV S7000*, Saibos' newbuild FDS (delivery Q42000), Coflexip Stena Offshore's *CSO Deep Blue* and Stolt Offshore/ETPM's *Polaris*. Phase one is expected to have 24 development wells completed from the first (dry) wellhead TLP with first production in 2002. Phase two, which should follow in about 18 months, will include a second TLP at Merah Besar and 21 development wells. These major facilities are to form the backbone for additional deepwater development opportunities via subsea satellite clusters tied-back.

North Sea

There are 383 subsea completions forecast for the North Sea constituting a multitude of smaller two to six well subsea satellite developments. Subsea is touted as the wave of the future in the North Sea as a cost-effective alternative to vastly expensive fixed platforms which are becoming a relic of the past.

Offshore Norway, Norsk Hydro is proceeding with the $300mn development of its Tune gas field via a multi-well subsea development tied-back to the Oseberg D platform. The project is expected onstream in 2002. Norsk Hydro has awarded DSND a $30mn EPIC contract for pipelay and subsea installation works.

In the UK sector, Talisman, together with partners British Gas and Paladin Resources, is moving ahead with the C$400mn development of the 75mn boe Blake field in block 13/24b. Blake will be a subsea development with up to eight completions in 100 msw tied-back to the Ross field which utilises the *Bleo Holm* FPSO. The first of eight wells will commence drilling in April 2000, with installation of subsea facilities in early 2001. Hydrocarbons produced from Blake will be transported via flowlines to a subsea production manifold for onward transportation to *Bleo Holm* via 10-inch and 12-inch diameter flowlines. Surplus gas will be exported via the existing Ross tie-in to the 34-inch diameter Frigg UK pipeline to the St. Fergus gas terminal.

BHP Petroleum and partners BP Amoco, Total-Fina/Elf and Veba O&G are moving forward with development of the block 9/8a satellite Keith oil field, located 320 km northeast of Aberdeen. Suspended appraisal well 9/8a-14 will be tied-back 7 km to the Bruce Western Area Development (WAD) with production slated for Q42000. BHP has confirmed contract awards to Rockwater which has landed the plum pipeline job with a 7-km flowline bundle including an 8-inch diameter production line, 3-inch diameter gas lift line, control and injection fluid lines. BHP will tie-in an existing well, 9/8a-14, directly to the BP Amoco's Bruce WAD manifold. Development plans also call for additional wells.

Kvaerner Oilfield Products reportedly has the contract for subsea hardware. This includes a single 5-inch diameter bore horizontal xmas tree and the control system. The tree is designed to accommodate a subsea multiphase flowmeter and two ROV-deployable chokes.

*Entitled: Quest Subsea Prospective Quarterly, *the report was published in March 2000. Houston-based Quest Offshore Resources owns and operates the comprehensive Quest Subsea-Data-Base that provides accurate future and active subsea and floating production data on a global scale. Provision of tailored or standard reports detailing any data covered in the data-base are now fully available. The company also provides similar tailored reports for data, information and activity for the global marine construction market. For further information, call +44 (0)1432 870626.*

Record-breaking firsts for deepwater hotspot

The benign environment offshore West Africa permits the use of relatively simple floating production systems. This contributed to Chevron's record-breaking achievement in bringing Angola's first deepwater oil field, Kuito, onstream at the start of 2000, just two and a half years after it was discovered. Work is also progressing on Girassol, the first ultra-deepwater field in the region. *Jeff Crook* reports.

Angola seems to be one of the hottest spots for deepwater oil exploration at the moment. This is certainly the view of Dick Matzke, the Vice Chairman of Chevron, who recently said: 'With the advent of Kuito production, Angola approaches the new millennium with the distinction of being one of the world's best areas for frontier oil exploration and production, especially in deepwater areas. In the years to come, development of the other significant discoveries we have made in block 14 will become a major element contributing to Angola's economic growth.'

The Kuito field lies 50 miles offshore the Cabinda Province (a small exclave to the north of the main Angolan territory) in block 14, a 1,560 square-mile concession located adjacent to block 0 where Chevron already produces around half a million barrels of oil per day. Partners in block 14 are: Chevron (operator, 31%), Angolan state oil company Sonangol (20%), Agip Angola Exploracao (20%), Total Angola (20%) and Petrogal (9%).

Having brought Kuito onstream at the start of the year, Chevron is now conducting development studies for the Landana and Benguela finds. A possible joint development plan with Kuito is being evaluated.

The Kuito development consists of a floating, production, storage plus an offloading (FPSO) vessel connected to 12 subsea production wells. The *FPSO Kuito* is a converted 228,700 dwt tanker 'spread' moored in 1,260 ft of water. She has the capacity to store 1.4mn barrels of oil and process 120,000 b/d of fluids. Oil production is expected to peak at 100,000 b/d in 2001. The vessel was converted at Sembawang shipyard, in Singapore, and has been oufitted with gas compression and water injection equipment.

Crude oil is loaded on to shuttle tankers by means of an offshore loading buoy, whilst associated gas is used as fuel on the FPSO or is re-injected into the reservoir. The subsea water injection scheme is to be implemented during a second phase of the project and will start operation in mid-2000. No natural gas is to be flared from the field after the initial start-up and commissioning phase, reports Mark Puckett, the Managing Director of Chevron's Luanda-based Southern Africa Business Unit. 'The Kuito facilities are state-of-the-art and meet the most stringent environmental standards,' he added.

Chevron announced contracts to a total $400mn for the first phase of the Kuito development in October 1998. The contracts were awarded to a consortium headed by Single Buoy Moorings Production Contractors, with partners ABB and Coflexip Stena Offshore, and cover the FPSO, export buoy, subsea wells and piping. Wells were drilled and completed by the Sedco-Forex rig *Sedco 708*.

Spreading the benefits

The use of 'spread' mooring is possible in benign enviroments and greatly simplifies FPSO projects such as Kuito. The seas off the West African coast are reasonably calm and waves tend to maintain a constant direction so that mooring lines can be deployed from bow and stern, holding the vessel in a fixed direction. This eliminates the need for turret, swivel and thruster systems, which are normally required in harsher environments such as the North Sea.

A turret provided for a harsh environment FPSO provides a stable platform for connecting riser and umbilicals to the seabed – the turret remains stationary as the vessel turns into the prevailing weather. However, the swivel provides only a limited number of paths to transfer fluids, electric power and control signals from the stationary turret to the rotating deck of the FPSO. By eliminating the swivel, spread mooring allows unlimited numbers of flowlines, service pipes, umbilicals and cables to be connected from the seabed right up to the deck of the FPSO.

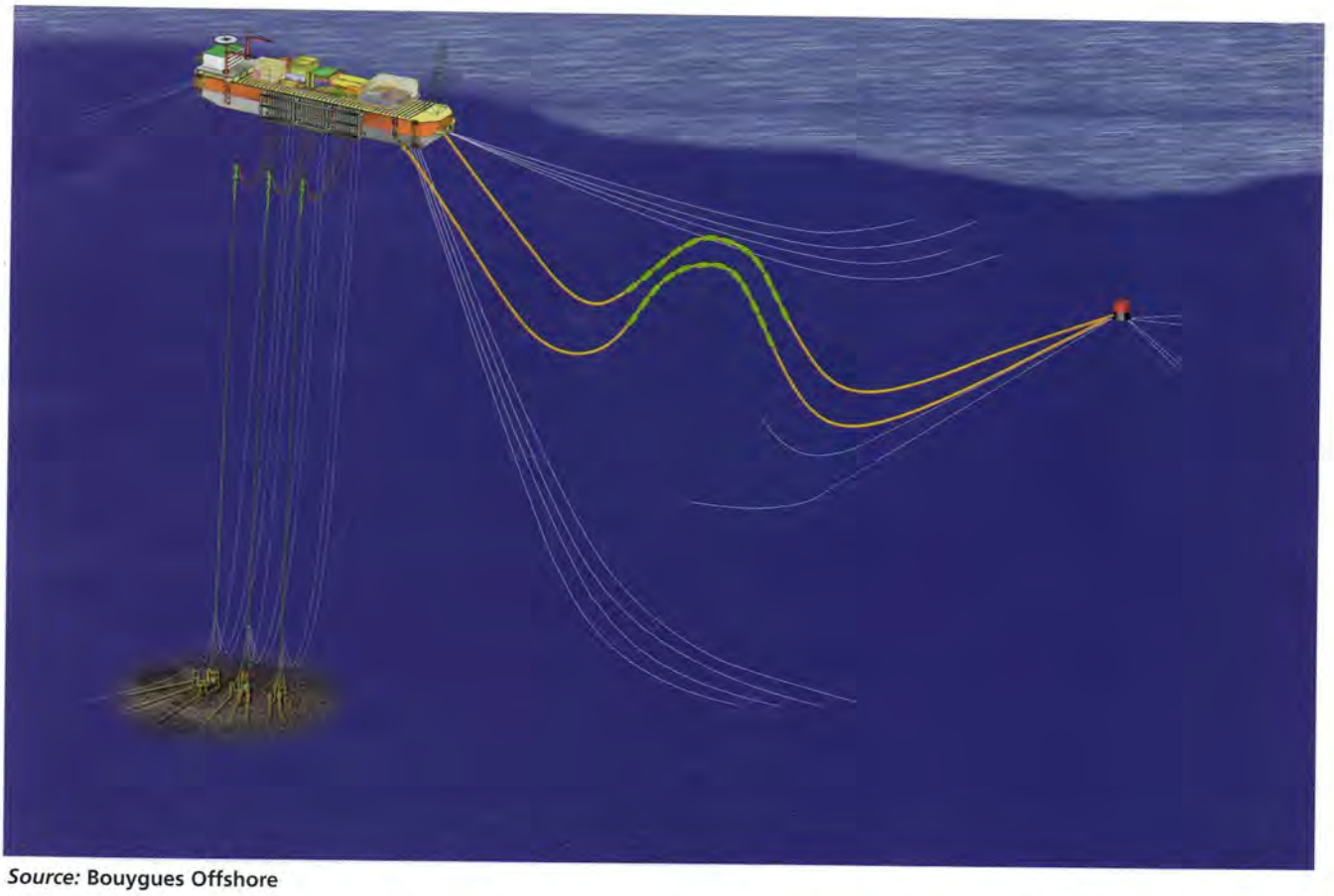
The subsea wells of a spread moored FPSO can therefore be connected back individually to host systems on the deck of the vessel. This allows the design of the subsea systems to be greatly simplified and may, for instance, eliminate the need for subsea equipment such as manifolds. It also permits pigging of the flowlines from the deck of a spread moored vessel – this is not possible when a swivel is fitted.

Innovative development

The relatively benign climate in the region has also allowed an innovative production concept, known as a riser tower, to be used for the Girassol project. One key challenge for this project was to maintain the temperature of the well fluid at a sufficiently high temperature to avoid wax formation in the cold conditions that exist on the ocean floor. The riser tower concept, which involves the use of buoyant towers, allows the lines to be foam insulated along much of their length.

The Girassol development, in 1,350 metres of water, is the deepest project so far undertaken in West Africa. The field was discovered in April 1996 and is located in block 17, located 200 km northwest of Luanda. Elf Exploration Angola (35%) is developing the field under a production sharing agreement with the Angolan state oil company Sonangol on behalf of field partners Esso Exploration Angola (20%), BP Exploration (Angola) (16.67%), Statoil (13.33%), Norsk Hydro (10%) and Fina Exploration (5%).

The field is being developed via an FPSO connected to subsea wells by means of the novel riser system. The development is taking place in two phases, with the first phase due to come onstream in mid-2001 and the second phase in 2002. It is hoped to produce



Source: **Bouygues Offshore**

700mn barrels of oil during phase one. Field life is put at 30 years.

The FPSO is claimed to be the largest vessel of its type in the world and is being built under a $700mn turnkey contract by Mar Profundo Girassol (MPG), which is a joint venture between Bouygues Offshore and ETPM. The FPSO will have storage capacity for 2mn barrels of oil. Designed to process up to 200,000 b/d of oil, the vessel will also be equipped with injection facilities capable of handling 400,000 b/d of water and 8mn cf/d of associated gas.

The hull of the FPSO has a double skin and was built by Hyundai Heavy Industries in Korea. The original plan was to mate a large integrated deck with the hull by an innovative float-over operation in Fos-Sur-Mer, in the South of France. But this plan was abandoned last year and now the deck has been sub-contracted to Hyundai allowing the hull/topside integration to be done in Korea, close to where the hull was built.

A Bouygues spokesperson informed *Petroleum Review* in February that: 'The hull has been formally delivered and the structure to support the deck has been installed. The topsides are in the process of being installed directly, without using the mating system. The integrated deck concept is, however, maintained – this will avoid any impact on the hull due to topside weight.'

Alto Mar Girassol (AMG), a joint venture between Bouygues Offshore, ETPM and Stolt Comex Seaway, is building the riser system under a $410mn contract at a new construction yard in Lobito, Angola. The riser system involves three towers, each of which receives fluids from the production system on the seabed and then transfers the fluids to the FPSO via flexible flowlines from buoyancy chambers at the top of each tower. The technology for the riser towers is reported to have been key to the success of the AMG bid.

There will be 40 subsea wells in total on Girassol – 23 production wells, 14 water injection and three gas injection wells – connected by flowline bundles and manifolds to the base of the riser towers. The vessels *Seaway Eagle*, *Saibos FDS* and *Polaris* will perform most of the subsea installation work.

The riser towers are anchored to the seabed by suction piles and each can house up to six flowlines and a number of service lines. The compliant design enables them to 'move like a reed' and thus compensate for motions of the FPSO. Foam material provides buoyancy and also insulates the risers to prevent the formation of wax and hydrate in the ice-cold conditions on the seabed.

Stolt Comex Seaway (SCS) will also play an important role in the subsea work as a partner in AMG. The company was also awarded a $20mn contract by Elf for the provision of remote operated vehicles (ROVs) for subsea work in block 17. The contract covers a three-year period from July 1999, with a further two-year option. The SCV3000 systems are designed to work in water depths to 2,000 metres. The close cooperation which has existed between SCS and ETPM was further enhanced when SCS acquired ETPM for $1.3bn in December 1999.

Bouygues Offshore is also actively investing in the deepwater market. Its subsidiary Saibos will take delivery in a few months of a newbuild 'Field Development Ship' (FDS) – a $150mn dynamic positioned (DP) vessel incorporating the latest innovations in ultra-deep offshore installations. In addition to this, Bouygues Offshore recently completed its new construction yard in Soyo, Angola, which will deliver the Girassol bundles.

Last May, Oceaneering Multiflex UK received a contract to supply subsea control umbilicals for the project. The umbilicals will be manufactured at the new Rosyth facility, which was inaugurated in June 1999. Multiflex says that the project will involve a network of approximately 85 km (53 miles) of umbilicals in all, and will utilise super duplex tubing for control and injection lines. Four different umbilical designs are required, including 10 dynamic umbilicals to link the subsea systems to the FPSO.

Maximising unit profitability and utilisation

AspenTech's DMCplus™ multivariate controller has played a significant role in improving throughput of the fluid catalytic cracker (FCC) unit at Agip Petroli's Sannazzaro refinery in Italy. The control system has allowed the unit to operate very close to its economic limits and has achieved pay-back within just two months, reports *Steve Park*, Senior Advisor & Director, Aspentech Global Solutions.

Agip Petroli's Sannazzaro refinery, Italy

Agip Petroli is the refining arm of the Italian Eni group. Since the beginning of privatisation of Eni in 1995 – with 64% of its shares traded in Italy and the US – Agip has embarked on a programme of refinery modernisation and improvement. As a part of this programme the company has established the Centro Richerche Sud, (CRS – Southern Research Centre) at Milazzo in Sicily, whose work includes a project specifically designed to 'increase the productivity, at low cost, of distillation and conversion plants of the Agip Petroli network.'

A major part of this project was to identify a technology partner who could provide control and management systems. After an extensive evaluation, during which CRS assessed a range of technologies, Agip decided on using Aspentech solutions. Part of the evaluation included a special project. There were two aims:

- to confirm that the technology could perform within the Agip environment, and
- to evaluate how well the prospective partners worked with the company.

The task assigned to AspenTech was to supply and implement a multivariate controller as part of an upgrade of the fluid catalytic cracker (FCC) at Agip Petroli's Sannazzaro refinery.

The FCC unit at the refinery has been continuously upgraded and in 1994 it was rebuilt with a focus on short contact time. This achieved significant improvements in performance but, after two years of operation, it was clear that there was still room for further improvement in feed rate, gasoline yields and enhanced octane ratings.

A number of actions were taken to produce these improvements. The hardware was upgraded, including the installation of new, state-of-the-art, riser nozzles to improve atomisation, modifying the blower air flow controls, adding new sensors and upgrading the gas plant instrumentation. Changing the catalyst to improve coke and gas selectivity increased both motor octane and LPG production to close to the theoretical maximum.

An advanced control system was needed to optimise the performance of the FCC unit and it was decided that the best way to achieve this was to bring all aspects of the unit under the control of one DMCplus controller. The DMCplus software runs a linear program to push processes to maximum constraints and hold them there safely. This goes beyond merely achieving economic returns, but instead provides the maximum possible returns over the life of the unit.

Specific areas brought under the control of the DMCplus were the wet gas compressor (WGC); absorbers, both primary and sponge and the stripper; the main column, particularly bottom temperature control; together with the CO (carbon monoxide) boiler; and the debutaniser and LPG Merox.

A key process constraint was the WGC. This operated below maximum feed rate, with considerable variation. The DMCplus controller smoothed the operation and increased it to the maximum.

Variability within the FCC operations also created bottlenecks in the CO boiler. Instead of running at the designed level of 2%, CO was spiking to 6% when coke production increased as residual fuel oil was maximised. This pushed the boiler beyond its feedwater supply. After the commissioning of the DMCplus controller, the CO was consistent at 2%, even up to 65% resid.

The DMCplus controller also led to improvements in the blower, gas plant hydraulics and the LPG flow.

FCC results

Each separate element of the project contributed to the improved utilisation and profitability of the FCC. The unit is now operating very close to its true economic optimum. Prior to the enhance-

ment project, the unit was operating at just under 190 t/h – it is now operating above 240 t/h. Dry gas yields are down by about 1.0 wt% and gasoline yields are up by around 2.5 wt%, with the MONC (motor octane number (continuous)) increased by 0.5%.

In specific terms, the DMCplus project reached pay-back in under two months.

Maximising performance

The most important part of any performance and profitability enhancement project is commitment – both from the people who will run the equipment after the changes and from the management team in the refinery. Without this, the best technology and the most advanced equipment will be wasted; with it, the result of any changes will be maximised, increasing throughput and raising profitability.

This same commitment has to be present during the project – the consultant and client have to work as a team, with full management support from both parties. The Sannazzaro implementation team included people from AspenTech, from the refinery staff and from CRS. The whole team worked on both the control applications and the physical upgrades. There was also a board overseeing the project, with senior managers from AspenTech and Agip Petroli.

Sannazzaro is now running close to its economic optimum

Long-term results

While the technical results were impressive, the project was also successful in demonstrating how well the two companies could work together. The structured approach and the development of joint teams of people from AspenTech, CRS and Sannazzaro played a considerable role in the results achieved.

As a result of the Sannazzaro FCC project, Agip Petroli and AspenTech have begun a five-year project to co-develop and implement advanced process control (APC) and real-time optimisation across all the major units in seven refineries. At Sannazzaro, this has already covered the CDU, hydrocracker and reforming plants, which saw pay-back within six months. The programme is now rolling out across the rest of the Agip refineries.

Can the oil price remain high?

In 1998 the oil industry experienced the worst oil price crash since 1986 with oil prices, in real terms, reaching levels not seen for 26 years. The extent of the fall caught most players and experts by surprise. Over the last year, however, oil prices have tripled. Is this sustainable? asks *Dr Mamdouh G Salameh.

The March 1999 cutbacks in production by the major producing countries have pushed oil prices higher over the year to reach levels nearly three times those of 12 months earlier. A number of factors will determine whether or not the current oil prices are sustainable:

- Global oil demand
- Opec discipline
- Iraqi oil exports
- Reserve depletion rate
- New oil discovery rates

Global oil demand

World oil demand is now rising at about 2% per annum and would have been higher but for the economic crisis which hit the Asia-Pacific region during 1997–98. The Asian crisis spread to other regions, such as Russia and Latin America, and has proved an effective brake on demand. While consumption of oil products in the Asia-Pacific region had grown at over 5% per annum for several years, it actually declined in 1998. Growth has resumed in 1999, but at a lower level than before (see **Table 1**).

Demand for oil is expected to continue to grow, reaching 76.89mn b/d in 2000, 85.61mn b/d by 2005 and 96.37mn b/d by 2010. Middle East producers will have to meet the major part of the additional demand. However, that will depend on the necessary investment being made to expand production capacity.

Opec discipline

In November1997, Opec, in the expectation of certain demand growth, raised its production quotas by nearly 10% – from 25.03mn b/d to 27.50mn b/d – effective from 1 January 1998, despite the fact that two months earlier Iraq's oil exports had reached 1.3mn b/d and Opec's production was rising.

Opec's decision – which coincided with a very mild winter, increasing Iraqi crude oil exports and the continuing crisis in Asia – soon led to a sharp decrease in oil prices. Matters were made even worse by some members exceeding their quotas. In an attempt to curb the fall in prices, Opec sought in spring 1998 to involve a number of non-Opec producers in an effort to reduce crude oil production.

In March 1998, Saudi Arabia, Venezuela and Mexico concluded an agreement to reduce their production by 600,000 b/d. In addition, they urged other producing countries to take similar action in order to reduce production by between 1.5mn to 2.0mn b/d. Opec members agreed voluntarily in March 1998 to cut production. Overall, the cut was more than 1mn b/d – little less than 5% of the total quotas. Non-Opec producers such as Mexico, Oman, Norway, Egypt, Yemen and Russia also committed themselves to reduce output.

But, by April 1998, it was becoming apparent that more cuts in production were needed to stop the downward slide in the oil price. So by June 1998, Opec decided on further reductions totaling 1,355mn b/d. Overall, from July 1998, Opec had agreed cuts amounting to 2.6mn b/d.

However, up to the beginning of 1999, Opec production only fell slightly – the cuts made by the ten member states, excluding Iraq, being largely offset by an increase in Iraq's output.

With world production significantly above demand, prices continued to fall,

Regions	1996	1997	1998	1999	2000	2005	2010
North America	22.27	22.71	23.20	23.70	23.99	25.84	27.84
Central & South America	4.30	4.48	4.90	4.90	4.94	5.87	6.97
Europe	15.61	15.79	16.12	16.36	16.67	17.96	19.35
CIS	4.36	4.34	4.26	4.02	4.12	4.55	5.15
Middle East	4.01	4.03	4.12	4.19	4.31	5.00	5.80
Africa	2.26	2.32	2.40	2.41	2.47	2.79	3.23
Asia-Pacific	18.93	19.80	19.38	19.71	20.39	23.60	28.03
World	71.74	73.47	74.38	75.29	76.89	85.61	96.37

Sources: IEA; BP Amoco Statistical Review of World Energy, *June 1999; East-West Center, Honolulu, USA; author's projections.*

Table 1: World oil demand (mn b/d)

reaching less than $10/b at the end of 1998. The position both produced and was aggravated by very high stock levels. At the end of September 1998, stocks of crude oil and products reached over 4bn barrels in the OECD countries alone, who only account for 60% of world demand.[1] Stock levels had been increasing since 1996 and did not start to fall until the end of 1998.

The consequences of this situation were dramatic, particularly for the producing countries. That is why the principal producers agreed a further production cutback in March 1999 amounting to more than 5mn b/d, of which 4mn b/d had been agreed by the Opec countries. The reductions decided in March 1999 resulted in a marked increase in prices.

Although the positive impact of lower oil prices on the economies of the main consuming countries remains limited (the cost of energy barely representing 1% of their GDP), the magnitude of the fall in market prices over 1998 was a cause of great concern for the major exporters. In the Gulf countries, 1998 GDP fell by about 2%. Opec oil revenues fell by $62bn, or by 36%, in 1998 from their 1997 level (see **Table 2**).

Country	1996	1997	1998	Change 98/97
Algeria	9.1	9.3	5.9	-37%
Indonesia	5.7	5.3	3.0	-43%
Iran	18.7	18.1	11.2	-38%
Iraq	0.8	4.6	5.2	+13%
Kuwait	13.6	13.7	8.3	-40%
Libya	9.5	9.1	5.7	-37%
Nigeria	15.8	15.5	9.6	-38%
Qatar	4.0	5.2	3.6	-31%
Saudi Arabia	56.8	56.3	36.1	-36%
UAE	17.0	18.8	12.1	-36%
Venezuela	18.7	18.8	12.0	-36%
Total	169.7	174.7	112.7	-36%

Sources: Opec; Centre for Global Energy Studies (CGES), London; Petrostrategies.

Table 2: Opec oil revenues ($bn)

Iraqi oil exports

The key player and driving force in the new geopolitics of oil could be Iraq. This is because once the UN sanctions are lifted, Iraq is determined to increase oil production to 6mn b/d by 2005. The country is now willing to open up to outside investment by offering production sharing contracts (PSCs) to would-be-investors. No other major Middle Eastern producer has been willing to do so. That Iraq is willing, suggests that it is desperate to increase production and that it is prepared to ignore the Opec line.

Iraq has increased daily oil exports from 700,000 b/d in November 1997 to 2.2mn b/d in 1999.[2] With a current production capacity of 3mn b/d, Iraqi oil exports are projected to reach 2.45mn b/d this year.

Because of rising oil demand from the Asia-Pacific region and Opec's limiting of its production, the oil market has been tightening for almost a year. In this tight market, Iraq has become the enormously powerful 'swing' producer – the only country willing, and able, to suddenly turn on or off its oil tap. When Iraq was pumping 2.7mn b/d, prices stayed steady or fell. But if it suddenly stopped, oil prices could skyrocket.

Global reserve depletion rate

Estimates at the end of 1999 indicate that there are just 935bn barrels of conventional oil yet-to-produce. What is common to all types of production is that peak production occurs at approximately the same time as the mid-point of total yield, except where production is artificially constrained by allocation arrangements.[3]

Different countries are at different stages of their depletion curves. Some, such as the US, are past their mid-point and in terminal decline, while others are close to mid-point, such as Norway and the UK. However, the five Gulf producers are at an early stage of depletion and can exert a 'swing' role, making up the difference between world demand and what others can supply. They can do this only until they themselves reach mid-point, probably by 2013.

It is predicted that the world's mid-point of depletion will come when between 900bn and 1,000bn barrels of oil have been produced (half the ultimate reserves of 1,800–2,000bn barrels) which, with 865bn barrels already produced, will probably be in two to five years' time. Assuming this coincides with peak production, shortages could be expected on this basis to arrive sometime between 2001 and 2004.[4]

It could be argued that the anticipation of shortages is bound to lead to a radical increase in the price of oil over the next few years. That would be likely to curb increases in demand, so that actual physical shortages could be delayed for a few years – although this delay will depend on the Middle East 'swing' producers. However, by 2008 they will be supplying 50% of the world's needs and by 2013 will be close to the mid-point of their own depletion. Although much higher prices will cushion the effect, chronic shortages of conventional oil would be predicted to develop from around 2010 onwards.

This raises the question as to how relaxed or concerned the oil industry should be about the fact that it has been depleting known reserves of around 1,034bn barrels at roughly 2.6%, or 27bn barrels, per annum.[5]

New oil discovery rates

Almost 90% of the world's conventional oil has been found. This time, an oil price crisis cannot be solved by bringing in fresh production from known basins awaiting development. The widely held view that improved seismic surveying and seismic interpretation have improved drilling success rates is not borne out by the 1998 figures. The 1998 success rate for exploration drilling (outside North America) was 29%, well down on the 38% level recorded in 1997.

The world is currently consuming 27bn barrels of oil a year on a rising trend, yet finding around 6bn barrels per year on a falling trend. It is essential to bear in mind that 70% of current oil production comes from fields more than 30 years old. Furthermore, peak discovery was in the 1960s, despite the technological advances and massive drilling activity since then. On this basis, we are about to face the peak in production corresponding to intensive exploration 30 years ago.

The total global reserve addition of 7.6bn barrels in 1998 was slightly better than in recent years, but still represents only 28% of the 27bn barrels produced in 1998. Over the last five years only 38% of global oil production has been replaced by new discoveries (see **Table 3**). According to Petroconsultants' *1999 World Petroleum Report* (*WPT*), the cumulative shortfall over the last five years amounted to 50bn barrels.[6]

This means that the Middle East 'swing' producers, with 65% of the world's proven oil reserves and just over one-third of global production, will assume a clear-cut leadership of the supply side of the oil market. In the major Opec oil-producing countries,

Year	Added in year	% of annual prod'n
1992	7.80	33
1993	4.00	17
1994	6.95	28
1995	5.62	23
1996	5.24	21
1997	5.92	22
1998	7.60	28
1992-98	43.13	25
Annual average	**6.16**	**24**

Source: WPT, *1999.*
**Data for world, excluding the US and Canada*

Table 3: Crude oil reserve additions (bn barrels), 1992-1998*

both exploration and investment in capacity expansion are down to minimum levels because the decision-makers in these countries have come to realise that the smaller the gap between output and capacity, the less the need to sell their oil at bargain basement prices.

What about non-conventional oil?

The view is often expressed that technical progress will soon make up for the increasing natural scarcities by developing acceptable substitutes and/or lowering the extraction and exploration costs of new reserves.[7] While some – and possibly a great deal – of the non-conventional oil such as heavy oil, tar sands oil and shale oil will eventually be available, it is unnecessarily reckless to believe, on the basis of evidence available at the present time, that it will be adequate from a quantitative point of view.

Oil supply from outside Opec countries is expected to start declining from 2000 onward. Oil supply from Middle East producers is projected to peak by around 2013. Since the total conventional oil supply will not be able fully to match demand, additional supplies of liquid fuels are expected then to become available from non-conventional sources. By 2008, global demand is projected to rise to 90mn b/d. Middle East producers will account for 45mn b/d of this, with non-Opec producers providing another 35mn b/d. The balance of 10mn b/d is supposed to come from non-conventional sources, rising to 20mn b/d in 2014 and 80mn b/d by 2030.[8] This is not only an exceptionally daunting task, but virtually impossible.

Gas is at a relatively early stage of depletion. Production is likely to grow to a peak or high plateau around 2020, allowing it to form a valuable substitute for conventional oil. However, it is in the area of transportation that the potential loss of cheap oil will make its effect felt most. It is also doubtful as to whether natural gas is going to play a major part in the transportation sector, especially when the growth in world population and the escalating demand for electricity is brought into the picture.

Conclusions

Rising global oil demand and the continuation of Opec's discipline and adherence to cutbacks in production will ensure that the oil price remains relatively high in the short-term. Although growing Iraqi oil exports have partly offset the production cuts made by Opec and other principal non-Opec producers, they may not exert as strong a downward pressure on the oil price so as to cause a major drop.

In the long-term, rising global oil demand and a declining discovery rate of new reserves coupled with a projected decline in non-Opec production, could lead to a radical increase in the price of oil in the opening years of the new millennium, with shortages being expected to arrive sometime between 2001 and 2004.

Footnotes

1 Jean-Pierre Favennec, *Can The Oil Price Remain Low?* Conference Proceedings of the 20th Annual North American Conference, 29 August-1 September 1999, Orlando, USA, p.458.
2 Hart's *E&P*, December 1999, p. 143. See also EIA's *International Petroleum Statistics Report*, Washington DC, August 1999, p.4.
3 Mamdouh G Salameh, *Technology, Oil Reserve Depletion & the Myth of Reserves-to-Production (R/P) Ratio*. Conference Proceedings of the 19th Annual North American Conference, 18-21 October 1999, Albuquerque, New Mexico, p.229.
4 Ibid., p.230.
5 EIA's *International Petroleum Statistics Report*, p. 17.
6 Petroconsultants' *World Petroleum Trends Report, 1999.*
7 H Houthakkar, Oil & the Global Agenda, *Nature*, 4 August 1997.
8 Jean-Marie Boudaire, *World Energy Prospects to 2020.* Paper presented to the British Institute of Energy Economics, London, 2 July 1998, pp.5-6.

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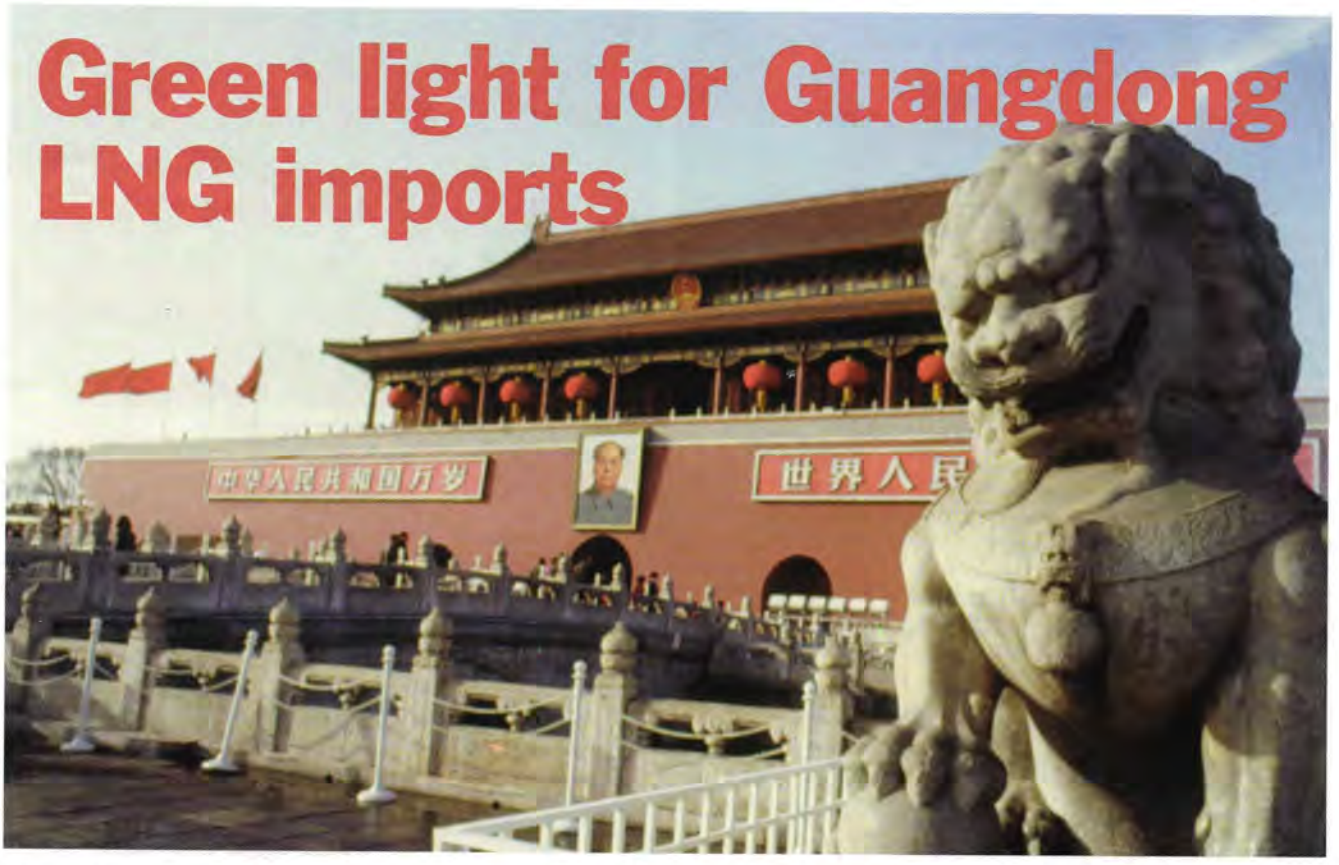
Green light for Guangdong LNG imports



China has officially approved the nation's first LNG import scheme, which is expected to result in a large increase in piped natural gas consumption in southern China. The project may also encourage the development of other LNG import schemes in future in major industrial regions such as Shanghai. *David Hayes* reports.

All photos by David Hayes

Approval for the LNG import scheme by the ruling State Council indicates an important change in policy by China's leadership in reducing airbourne pollution caused by heavy reliance on coal and a change in traditional reluctance to become reliant on foreign energy sources.

Rapid economic development has created enormous airbourne pollution problems over recent years. China's dependence on coal for 73.5% of its prime energy use has contributed to nine Chinese cities being among the top ten worst polluted cities in the world. Increasing gas consumption is seen as an important way in reducing coal related pollution.

Guangdong LNG terminal project will involve constructing a receiving terminal at Chentou Cape, near Shenzhen on the border with Hong Kong, and a high pressure transmission pipeline across Guangdong Province at a cost of $500mn. The pipeline will run from Shenzhen to Guangzhou, capital city of Guangdong Province, and continue to the nearby industrial city of Foshan. It will eventually be extended to Zhuhai near the mouth of the Pearl River.

Plans call for the LNG import terminal and gas pipeline to be built in two stages. Phase 1 – which now is expected to complete in 2005 – will involve the construction of facilities capable of importing 3mn t/y of LNG and a 300-km pipeline from Shenzhen to Foshan.

A major customer for the Phase 1 gas supplies will be a planned 3,000-MW combined cycle power plant. In addition, a pipeline spur will be built to Nanya Island in Hong Kong where Hongkong Electric Power Co plans to build a gas-fired power plant that will use about 800,000 t/y eventually.

Phase 2 of the project – due for completion by 2009 – is expected to involve expanding the terminal to handle 5mn t/y of LNG, while the high-pressure transmission pipeline grid will be extended a further 240 km. A 3,960-MW gas-fired power plant will use some of the additional LNG supplies, while five existing power plants will convert to use gas.

By 2010 the Guangdong gas pipeline will carry 7.7bn cm/y of gas. Some 6.2bn cm will be produced from LNG feedstocks, while an additional 1.5bn cm will be supplied from the South China Sea. The South China Sea gas will enter the Guangdong pipeline at Zhuhai where a pipeline spur will reach landfall from the existing submarine pipeline supplying gas from the Yacheng 13-1 gas field to China Light & Power Co's Black Point power station in Hong Kong.

To promote gas use in Guangdong pipeline spurs are expected to be constructed along the transmission route to provide piped natural gas supplies to a number of important cities. Apart from Shenzhen, Guangzhou and Foshan along the main transmission

City centre, Guangzhou, Guangdong province

Cyclists, Guangzhou, Guangdong province

route other cities which are due to receive piped gas supplies include Huizhou, Zhaoqing, Jiangmen, Zhongshan and Zhuhai. Small piped LPG schemes have already been installed in many cities, mostly supplying factories and residential complexes. Most schemes have been designed to use LPG until piped natural gas supplies become available.

International interest

The news of the project approval has generated international interest among various overseas companies. Procurement is due to begin once project financing is in place.

'Until recently the whole of China's energy needs were focused on coal. Then Deng Xiao Ping said that China should not rely on one fuel source alone,' commented a western diplomat. 'Hydroelectric and nuclear power development is going on now but still little power is derived from gas which is used as a feedstock for fertiliser and petrochemicals. The thing that has crept into the equation is environmental awareness. Also, China has noticed that the price of LNG is at an all time low and that a buyer's market exists. These factors are combining to drive China to use more gas for power generation.' The Chinese Government's plans call for gas consumption to grow about four-fold over the next decade. Increased supplies will come from growing domestic production and imports.

According to official forecasts gas production in China will reach 25bn cm in 2000, accounting for 2.2% of China's primary energy consumption. Gas demand is forecast to grow strongly to 95bn cm in 2010, accounting for more than 6% of China's total energy mix – an increase of more than four-fold compared with 22bn cm in 1998.

China's four leading gas fields are Xinjiang, Shaanxi-Gansu-Ningxia, Sichuan-Chongqing and Qinghai. These are forecast to produce a combined total of 16bn cm of gas this year compared with CNPC's 15.5bn cm target in 1999. By 2010, the four fields are expected to almost triple production and produce 45bn cm.

According to government forecasts gas supplies amounting to 120bn cm/y will be available by 2010 if all China's gas production and import plans are met. However, plans to import 10bn c/y from east Siberia into northeast China and between 20bn to 30bn cm/y from Irkutsk will require huge investments and could be delayed, reducing the volume of imported supplies that will be available in 2010.

Second project pending

Meanwhile, China's second LNG import scheme is awaiting government approval. To be built near Shanghai to supply the fast developing east China coastal region, the 3mn t/y LNG import scheme will involve supplying LNG to two power stations and for piped distribution in various cities along the Yangtze River.

Four sites have been proposed to build the LNG import terminal – Zhong Men Tang Island near Shanghai; Da Xie Island and Li Diao Island, both of which lie off Zhejiang Province; and Ludong Island offshore Jiangsu Province.

'There is a dispute over the choice of site,' commented an engineer working for one foreign company hoping to be involved in constructing the import terminal. 'Once the site is decided the three provinces will form a consortium and prepare a feasibility study for presentation to the State Development Planning Commission.'

The 3mn tonne import scheme is intended to supply two 2,400-MW combined cycle power plants – one to be built in Shanghai, the other in neighbouring Zhejiang Province. In addition, gas will be supplied for piped distribution to various cities in east China, including Shanghai, Hangzhou, Jiaxing, Ningbo and other cities in Zhejiang Province, and Nanjing, Suzhou and Changzhou in Jiangsu Province.

Plans call for the Shanghai LNG import terminal to be completed in 2005 with the power plant construction programme and development of city gas distribution facilities which are timed to match the terminal completion schedule. Several city gas companies are already starting to upgrade their gas distribution systems in anticipation of the eventual arrival of natural gas.

'The city governments are keen to use natural gas because of their environmental pollution problems. They want to cut coal consumption,' the engineer explained. 'Gas is more expensive than coal, but fitting desulferisation facilities for coal-fired power generation means such power generation is nearly the same as using gas. Most coal-fired plants in China do not have this equipment. In future if coal-fired stations cause pollution they will have to pay a fine.'

In fact, Shanghai's first LNG utilisation scheme will use domestic natural gas – rather than imported LNG – for a winter peak shaving, although the size of the project is much smaller than the 3mn t/y LNG import scheme.

Currently gas from the offshore Pinghu gas field is piped to Shanghai where it is distributed to household consumers. To ensure that sufficient supplies are available to meet the winter peak load or the temporary suspension of piped Pinghu supplies, the Shanghai Municipal Natural Gas Transmission & Distribution Co has built a peak shaving facility which converts Pinghu gas into LNG for storage purposes and then liquefies the gas for piped distribution during winter peak hours to supplement piped supplies.

The French companies, Sofregaz and Technigaz of France completed construction of the Shanghai LNG peak shaving scheme in December 1999. The plant is located in the eastern Pudong district of Shanghai. It consists of a 174 cm/d LNG pre-treatment/liquefaction facility and a 20,000 cm storage tank. The plant is designed to hold a 10-day supply of gas for the Pudong area of Shanghai in case of a cut in gas supplies from the Pinghu field due to a pipeline

failure, typhoon or an offshore plant shutdown. Apart from providing backup supplies the plant will provide additional gas supplies for peaking consumption during winter months. A maximum of 120 cm/hour of LNG can be sent out depending on the distribution network supply needs.

Projects in the pipeline

China has also announced plans to move ahead with a number of major gas transmission and gas field development schemes during the next few years. Recently plans were announced to bring forward construction of the first large natural gas pipeline from northwest China in an effort to accelerate economic development in the impoverished region. The 953-km gas pipeline will run from western Qinghai Province east to Lanzhou, capital of Gansu Province, allowing the city's 2mn population to burn clean natural gas rather than coal gas.

Beijing's approval of the project is viewed as a sign of official determination to tackle severe air pollution in many cities around the country as well as commit substantial funds to the development of China's backward western regions. The Chinese Government has said that development of the poor but resource-rich central and western areas will be among the priorities of the tenth five-year development plan, which begins in 2001.

Approval for the Qinghai to Lanzhou pipeline, which will be built at a cost of about Y4.4bn by China National Petroleum Corporation (CNPC), was speeded up after a visit to Lanzhou by premier Zhu Rongji in October last year. The Premier was reported to be appalled at the bad air in Lanzhou, which has the dubious distinction of being rated as the world's most polluted city in a survey, by the World Resources Institute in Washington.

Scheduled to get underway in April, the gas pipeline scheme now is due to be completed by October 2001, over two years ahead of its original schedule. The pipeline initially will carry 2bn cm/y of gas, but will be designed with an ultimate transport capacity of 4bn cm/y.

Elsewhere, Enron of the US is expected to take a 45% stake in an 800-km gas pipeline scheme to be built from southwest Sichuan province to Wuhan, capital of Hebei Province in south central China. This pipeline also will be operated by CNPC.

Other pipeline schemes under consideration include a 4,212-km natural gas pipeline from the southern Xinjiang Province's Tarim oil and gas field to Shanghai. The pipeline is expected to cost about $6.6bn and will be operated by CNPC. The pipeline would take about 10 years to build and would transport gas from large gas fields in the north of the Tarim Basin to industrial and residential customers in Shanghai and other east coast provinces.

Elsewhere, gas reserves in the Ordos Basin overlapping Ningxia and Gansu Provinces is due to be developed by Shell, which will pump the gas through the existing underutilised gas pipeline to Beijing. Natural gas in Beijing is already supplied from Gansu and Ningxia provinces and accounts for 20% of the capital's city gas supplies.

IP education and training

Spreading the word

This year's Association for Science Education (ASE) Exhibition and Conference 2000 was held at the University of Leeds on 4–8 January. The event is an important forum for science teachers to gather information and swap notes. *Gill Haben*, IP Education and Training Manager, outlines how the Institute of Petroleum participated. She also reports on a recently completed IP school project targetting 14 to 15 year olds.

The Institute of Petroleum exhibited its full range of educational and career information at the ASE show. Forums such as these are key to the exchange of ideas and views with the education profession and it is essential that the Institute provides the most appropriate resources to help teachers teach science.

Over three days I talked to hundreds of people, many of whom already knew about, and appreciate, the Institute's resources. It proved to be an extremely valuable means of gathering information about what our customers require and we plan to further tailor our services to meet these needs as they develop.

If any readers of *Petroleum Review* feel that there is a gap to be bridged in our teacher education and training programme, and/or if they have any suggestions on how we might develop our programme further, please feel free to contact me on +44 (0)20 7467 7135.

Role-play project

In September 1999, the Institute of Petroleum travelled with its role play *Burnbridge Project* to four schools in Aberdeenshire. The programme proved to be extremely successful and enjoyable for all concerned – the young and the not so young alike!

Although a fictional scenario, the *Burnbridge Project* is based on realistic data that outlines a proposal to develop a new oil and gas find. Pupils aged between 14 and 15 years old are asked to take up various roles as interested parties, and argue for and against the development.

The project was taken from the IP publication *Oil a Natural Resource – Information and Case Studies for GCSE Geography*. The booklet formed the main basis of a day of role-play and presentations. Teachers and pupils were supported by members of the IP's Aberdeen Branch. All participants benefited from the experience:

- The 190 pupils certainly gained a sense of achievement.
- The teachers had the opportunity to gain a greater insight into the international oil and gas industry.
- The Branch members had the satisfaction of using their very real and broad experience to help guide the pupils and bring the industry to life. None of them had participated in this sort of activity before and reported that they found it hugely rewarding and enlightening – an ideal way of developing their own lifetime learning.

ip://awards/2000

The IP is pleased to announce the launch of a new suite of Annual Awards acknowledging outstanding achievements and examples of good practice within the international oil and gas industry. A total of seven awards will be presented for the first time at the IP's Autumn Lunch in November 2000.

Wood Mackenzie, global consultants, have joined the project as frontline sponsors and we are now offering special sponsorship opportunities to other organisations. A number of companies have already signed up, including Deutsche Bank, Texaco, EDS and Lasmo.

Entries from both companies and individuals, whether in industry or academia, are invited by no later than 30 June 2000. The judges, consisting of leading executives, academics, analysts and editors, will be looking for those achievements which have the greatest impact, or potential impact, for the global petroleum industry. Entries may be self-nominated, or accepted with the knowledge of the nominee, and must be based on a project or achievement which took place or was completed in the last 12 months.

Further details can be found on the new IP website **www.ipawards.com/2000** or by contacting Sarah Frost Mellor on +44 (0)20 7467 7150; e: **sfm@petroleum.co.uk**

Sponsored by Deutsche Bank

International Platinum Award

(the achievement with the greatest global impact)

Judging Criteria

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

Given the diverse and pioneering nature of our industry, achievements do not always fall neatly into categories. Six of the IP Awards acknowledge those that do; this award is intended to ensure that other, outstanding, achievements do not go unrecognised. Overall financial performance is one indicator of success, but the judges will also be looking for fresh thinking and strategic problem-solving in response to specific challenges.

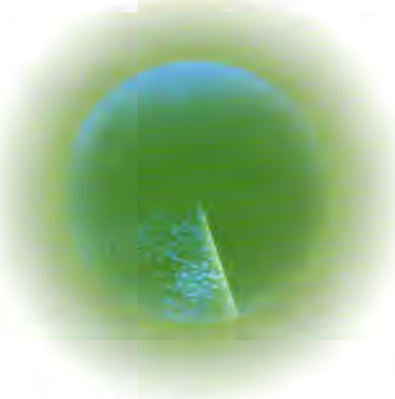
Innovation Award

(most outstanding innovation)

Judging Criteria

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

It is sometimes said that the petroleum industry is characterised by evolution not revolution: entirely new products or processes tend to be few and far between. This award may go to just such an innovation, but the judges will also consider outstanding examples of the industry's skill at appreciating and applying breakthroughs in applied technology, such as microelectronics and computer science.



Sponsored by Texaco

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

The petroleum industry could not operate without proper regard to safety. Standards for safe practice are robust, and subject to continuous review and refinement. Safe practice is not instantaneous; it is demonstrated over time. Historically, the IP has played a central role in facilitating safe, sustainable self-regulation of the highest order. This award will acknowledge the year's most impressive new step towards enhancing the industry's safety record.

Information Technology Award
(best application of new IT)

Sponsored by EDS

Judging Criteria

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

Information technology is an exciting business frontier: a place where new and better solutions are being devised, almost on a weekly basis. There can be little doubt that these new technologies – often grouped under the heading 'e-business' – will change the face of the industry. As well as considering the application of new products and services, the judges will be looking for a pioneering approach to planning and implementation.

Communication Award
(greatest contribution to awareness of industry issues)

Judging Criteria

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

There are many 'popular' conceptions – and misconceptions – about the industry's objectives and operations. It is the responsibility of the industry to ensure that legitimate public and media interest, in issues such as safety and the environment, is met by accurate and timely information. Regulators, policy-makers and other authorities also need to be kept informed. This award will recognise the year's best contribution to better understanding of the global issues confronting the industry.

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

Like safety, environmental considerations are an increasingly important driving force for the industry, and can exert a significant influence on the prioritisation of technological development. The judges for this award will consider the quality standards demanded by customers and regulators alike, and will be looking for examples of intelligent and sustainable responses from the industry.

Community Initiative Award
(best new initiative to benefit the community)

Sponsored by Lasmo

Judging Criteria

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

From the laying of pipelines to the opening of a new petrol station, there are not many industry operations which do not have a direct impact on the local, or even national, community. In some cases, these same people may be employees, customers or local regulators. Cost and efficiency targets must be balanced with a proper consideration of community expectations. This award will recognise the year's most successful response to this ongoing challenge.

Everyone Needs

...Standards

Aviation Fuel Handling

The international aviation refuelling industry has historically worked with the IP and the American Petroleum Institute (API) to produce Codes of Safe Practice and performance standards to facilitate safe operations and the technical integrity of equipment used at airports. The preparation and use of such publications also serves to maintain a degree of self-regulation.

The IP Aviation Committee first produced what is now the *Airports Safety Code* (*Model Code of Safe Practice Part 7*) in 1965, the third edition of which was published in 1998. The API Aviation Technical Services Subcommittee has a similar history of producing technical publications, including the global standard for filter/separators, API 1581 (now in its fourth edition).

Within both organisations there was an increasing trend to provide technical input/comment on each others draft documents, to ensure that they have the necessary international scope. As the use of resources within the industry evolved, it became clear that there was a need to develop a production process that addressed the following issues:

- Facilitating the most efficient use of the decreasing number of aviation technical experts caused by oil company mergers, acquisitions and downsizing.
- Maintaining the technical integrity of the publications used by the international petroleum industry.
- Addressing the requirement for aviation industry representatives to 'witness' manufacturer qualification tests, as currently specified in API and IP documents.

Following discussion between the two organisations, and their respective aviation committees, a Memorandum of Understanding has been developed. It has been agreed that in future all aviation fuel handling standards will be prepared jointly by experts from the IP and API, and published jointly between the organisations. It is anticipated that this will address the concerns outlined above. The following documents form part of this agreement:

- *(API) 1529 Aviation Fueling Hose, 5th Edition, May 1998*
- *(API) 1542 Airport Equipment Marking for Fuel Identification, 6th Edition, 1996*
- *(API) 1581 Specification and Qualification Procedures for Aviation Jet Fuel Filter/Separators, 3rd Edition, December 1994*
- *(API) 1584 Four Inch Hydrant System Components and Arrangements, 2nd Edition, 1994*
- *(API) 1501 Recommended Practice for Retail or Consumer Aviation Fueling Facilities, 1st Edition, provisional 2000*
- *(API) 1582 Similarity Calculations and Software for Aviation Jet Fuel Filter/Separators, 1st Edition, provisional 2000*
- *(IP) Airports Safety Code – Model Code of Safe Practice Part 7, 3rd Edition, 1998*
- *(IP) Specifications and Qualification Procedures – Aviation Fuel Filter Monitors with Absorbent Type Elements, 2nd Edition, 1995*
- *(IP) Specifications and Qualification Procedures for Aviation Fuel Microfilters, 1st Edition, 1999*
- *(IP) Aviation Hydrant Pit Systems – Recommended Arrangements for: Part I: New Facilities, Part II: Replacement of Obsolete Valves in Small Pit Boxes, 2nd Edition, 1990*
- *(IP) The Inspection and Testing of Airport Hydrant Pit Valves, 1st Edition, 1993*
- *(IP) Recommended Practice for the Cleaning of Aviation Hydrant Systems, 1st Edition, provisional 2000*

The first joint publication has already rolled off the presses. *API/IP 1581 Specification and Qualification Procedures for Aviation Jet Fuel Filter/Separators*, 4th edition, February 2000 is now available to purchase through the IP or API.

The drafting of the 3rd edition of *IP/API 1584 Four Inch Hydrant System Components and Arrangements* is also nearing completion. This 'new look' document incorporates the technical requirements of the IP publication *Aviation Hydrant Pit Systems – Recommended Arrangements for: Part I: New Facilities, Part II: Replacement of Obsolete Valves in Small Pit Boxes*. It is expected to be published by mid-year.

API/IP 1583 3rd edition, nearing completion

The IP's performance standard for aviation fuel filter monitors is now being developed jointly by the IP and API to maintain its global application. Revision work commenced in May 1999, with an open industry meeting hosted by TOTAL in Paris (reported in *Petroleum Review*, August 1999). Since then £21,000 has been spent on monitor research to support the inclusion of a new test fuel chemistry and test dust. The IP research funding has also been used to confirm that the standard will not be able to cover monitors for use in jet fuel containing Fuel System Icing Inhibitor. The first draft of the joint API/IP publication was issued for industry review in March, and a follow-up industry meeting held at the end of March to solicit feedback. It is anticipated that the 3rd edition will be published this autumn.

NEW Publications and Data Services

The African Oil Industry

Mark Ford and Thalia Grifiths (FT Energy, Maple House, 149 Tottenham Court Road, London W1P 9LL, UK). ISBN 1 84083 200 2. Price: £395 ($632; euro 569).

This report provides a detailed overview of Africa's oil industry, from Algeria to Zimbabwe, and examines the key issues facing the continent's hydrocarbons sector. It looks at the increasing role of the private sector and foreign investment in the African oil market and summarises the projects currently underway in each country.

Fuels and Engines

Jean-Claude Guibet (Éditions Technip, 27, rue Ginoux, 75737 Paris Cedex 15, France). ISBN 2 7108 0751 3. 904 pages (2 volumes). Price: FFr 950 (euro 144.93).

This book describes in detail the new technologies that are currently in use or under development, which are designed to provide high-quality fuels and ensure their optimal use in the engines used to power automobiles, trucks, aircraft and ships. All types of fuels are covered: gasolines, diesel fuels, LPG, natural gas, biofuels, jet fuels, heavy fuels, and fuels for special uses. The evaluation criteria include vehicle performance and driveability, reductions in fossil fuel consumption, and environmental protection. The specific situations encountered in each region of the world – including the US, Europe, Japan and the developing countries – are analysed and compared, with a focus on energy, economics and politics.

Valves, Piping and Pipelines Handbook

(Elsevier Advanced Technology, The Boulevard, Langford Lane, Kidlington, Oxford OX5 1GB, UK). ISBN 1 85617 252 X. Price: £131 ($215; euro 192).

Now in its third edition, this book provides information on new products and applications in the valves and piping market. Coverage includes the latest valve designs available that are capable of reliable operation in difficult fluid handling situations; new corrosion and temperature resistant materials and coatings; and improved polymers, plastic composite materials and ceramics. The book features a buyer's guide, trade names index, alphabetical list of manufacturers, and a classified index by product category.

Oil Prices and Fiscal Regimes

Bernard Mommer (Oxford Institute for Energy Studies, 57 Woodstock Road, Oxford OX2 6FA, UK). ISBN 901795 09 8. 37 pages. Price: £20.

This study discusses in detail the liberal fiscal regime in the oil pricing sector (where the marginal fiscal take is zero and the state taxes only excess profits, carefully avoiding the free flow of investment, in order to keep prices low) and the proprietal fiscal regime (characterised by a positive marginal rent which puts a threshold on the flow of investment). The paper draws important implications for oil prices, should the liberal supercede the proprietorial regime.

Global Vehicle Emissions

Michael Nevin and Dr Mark Barrett (FT Energy, Maple House, 149 Tottenham Court Road, London W1P 9LL, UK). Code RNCOE9. Price: £485 ($825; euro 698).

This report examines the environmental concerns driving policy, the regulatory process applying to automotive emissions and what objectives are being adopted in the EU, Japan and US. It goes on to look at technologies currently available, or under development, which could be applied to achieve emissions reduction.

** Held in IP Library*

Latest from the Library

Free Internet access

IP Members visiting the library can now have half an hour free Internet access on each visit – availability allowing. Don't miss out – contact Liliana El-Minyawi to book a session, which includes access to Telerate.

Information for Energy Group (IFEG)

The IFEG Seminar on 10 May 2000 will focus on electronic journals for the energy industries. See advert on page 55 or contact Catherine Cosgrove for more information.

New editions to library stock.

- *Accounting for Oil and Gas Exploration, Development, Production and Decommissioning Activities: Statement of Recommended Practice – SORP.* Oil Industry Accounting Committee (OIAC), London, UK, January 2000.
- *The Directory of Chemical Products and Services 2000.* 10th Edition. Chemical Industries Association. Hamlet Information Services, West Wratting, Cambridgeshire, 2000.
- *Gas and Power 2000: An Insight into Europe's Developing Gas and Power Market.* 1st edition. Edited by Martin Quinlan; Patrick Heren *et al.* Petroleum Economist, London, UK, January 2000.
- *The Occurrence of Selected Hydrocarbons in Food on Sale at Petrol Stations Shops and Comparison with Food from Other Shops: A Literature Survey.* J M de Wolf, Dr C M B van den Bend. Concawe, Belgium, Brussels, January 2000.

Contact details

- Information queries to:
  Chris Baker, Senior Information Officer, +44 (0)20 7467 7114
  Sue Tse, Information Officer, +44 (0)20 7467 7115
- Library holdings and loans queries to:
  Liliana El-Minyawi, LIS Assistant, +44 (0)20 7467 7113
- Careers and educational literature queries to:
  Jasmine Gavhure, Information Assistant, +44 (0)20 7467 7116
- Website queries to:
  Perry Hackshaw, Webmaster, +44 (0)20 7467 7112
- LIS management queries to:
  Catherine Cosgrove, Head of LIS, +44 (0)20 7467 7111

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

Vacancy – Information Officer

We have a vacancy for the post of *Information Officer*. Please contact Catherine Cosgrove on +44 (0)20 7467 7111, or view our website at **www.petroleum.co.uk** for further details.

Membership News

NEW MEMBERS

Mr A Alcides Da Silva, Portugal
Mr S Babkov, JS Fobii
Mr V Barmine, Dongazstroy Proekt
Ms E Batalova, IP Oilhouse Limited
Mr B M Bell, Poole
Mr N A C Bright, Veritas DGC Limited
Mr D J Buckland, Southsea
Mr B Butler, New Malden
Mr D Cacoyiannis, Nafta Petroleum Limited
Mr G J Cantlay, Aberdeen
Mr D Constable, Fluor Daniel Inc
Mr D H Coulter, Oiltools (Europe) Limited
Ms P A M Coutts, Alpheus Environmental Limited
Mr F Danelle, Shell International
Mr J C Dawson, RS Components Limited
Dr B Dilworth, Infineum UK Limited
Ms O M Famodimi, Nigeria
Mr R Ferryman, Spirax Sarco Limited
Mr D Fishman, Atlantic Technology Services
Mr S Gandhi, Caltex Oil (Kenya) Limited
Mr J Goderis, Great White Fleet Limited
Mr S J Gondo, Indonesian State Oil & Gas Company
Mr I Grainger, Kildrummy Technologies
Mr O M Gustavsen, Norwegian Oil Trading
Mr R S Harvey, Haslemere
Mr R J Heins, Shell Global Solutions
Ms O Janchiv, Petrovis Company Limited
Mr P J Jenkins, Therma Productions Limited
Mr C Lambert, Tribe Incorporated
Mr L C Mallen, ICM Management Consulting
Mr M-L Ng, Hong Kong
Ms A Nijs, Shell Marine Products
Ms J A Oakley, Emsworth
Mr A A E Ogwu-Chinuwa, USA
Ms G Orsoo, Petrovis Company Limited
Mr G Petit, Shell International Trading & Shipping Company
Dr M D Pittam, Bushey
Mr S Pronine, IP Oilhouse Limited
Mr A R Punt, Logic
Mr A G Raistrick, Carlisle
Mr P L Roberts, Inverness
Mr J Shields, Scunthorpe
Mr M J Smith, Trident Geophyscial Limited
Mr H Stables, B2B Technology
Mr N S Stanbury, Liss
Mr S Thorington, Ocean Energy
Mr G Volpi, Tintels Integrated Logistic Service
Mr W A Wadee, Bulk Oil Storage & Transportation
Mr M Zaheen, Lazard Brothers & Company Limited
Mr D Zanussi, Northwest Airlines

NEW STUDENTS

Mr F E Akume, Nigeria
Mr G Chalaris, Glasgow
Ms K Ehuert, London
Ms E Esiso, London
Mr B E Ewiwile, Nigeria
Ms V E Forster, London
Mr E M Igwe, Nigeria
Mr A O Ilah, Nigeria
Mr N A Lamont, Nottingham
Mr L P Lee, Nigeria
Mr I L Odumo, Nigeria
Mr S E Okoekpen, Nigeria
Mr A Psarompas, Glasgow

NEW CORPORATE

Petrolsoft Europe Ltd, Portland House, 4 Great Portland Street, London W1N 5AA, UK
Tel: +44 (0)20 7436 4788 Fax: +44 (0)20 7436 4776
e:mruis@petrolsoft.com
Representative: Mark Ruis, Manager of European Operations
Petrolsoft Corp. is the leading provider of unified supply chain management systems for the downstream petroleum industry. Founded in 1989 at Stanford University, Petrolsoft focuses on the supply and distribution of bulk refined fuel products, including motor gasoline, distillates, kerosene and jet fuel to both retail and wholesale markets.

Organisations that have benefited from Petrolsoft's solutions include integrated oil companies, petroleum product refiners, petroleum product marketers, and petroleum product carriers. Current customers include ARCO Products Co., BP Amoco plc, Caltex (Australia), Chevron Canada Ltd., ExxonMobil, Marathon Ashland Petroleum LLC, Sun Refining & Marketing USA (Sunoco), Sunoco Inc. (Canada), Tosco Marketing Company, Ultramar Diamond Shamrock, YPF SA (Argentina).

NEW FELLOW

Mr G Bird FInstPet
Mr Bird is currently Training Technician for Mobil/BP Refinery which is based at Standford-le-Hope in Essex. Mr Bird first joined Mobil in 1978 as a Member of the Security Administration Relations department which succeed his career as a Police Officer. He is a member of the Professional Association of Diving Instructors and holds the grade of Divemaster. Mr Bird is an active member of his local branch and for the past three years he has been Entertainment Chairman, responsible for organising the highly successful annual dinner and dance.

DEATHS

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

	Born
Dr R G Cockerham	1920
Mr A T Langton	1917
Mr R W Morton	1915
Mr B A Nolan	1922

OBITUARY

Denys 'Tiny' Milne, CBE 1926–2000

It is with deep regret that we report the death of Denys Milne, CBE and past IP President (1978–1980) on 9 February. After graduating from Oxford, Mr Milne joined the Colonial Administration Service as an Assistant District Officer to Maiduguri in Nigeria. He was recruited by BP in Africa in 1955, and worked for the company for nearly 30 years.

Mr Milne was recalled to the UK in 1975, leaving his position as Managing Director of BP Southern Oil, to head the team responsible for splitting the assets of Shell-Mex and BP. He was subsequently appointed Managing Director and Chief Executive of BP Oil.

He was also involved in a number of other activities over the years, ranging from President of the UK Petroleum Industry Association (1980–1981), member of the Scottish Economic Council, Chairing the Council of Epsom College (which he attended as a boy) and the Horder Centre for Arthritis to serving as a Trustee of the Centre for Southern Africa Studies at York University and of the National Motor Museum.

EVENTS Forthcoming

APRIL 2000

5–6 **Glasgow, UK**
Federation of Petroleum Suppliers' Millennium Exhibition and Conference
Details: FPS, UK
Tel: +44 (0)1565 631313
Fax: +44 (0)1565 631314
e: Fps@btinternet.com

9–13 **Monte Carlo**
Monte Carlo Tanker Event 2000
Details: Anders Baardvik
Tel: +47 22 12 26 52
Fax: +47 22 12 26 41
e: anders.baardvik@intertanko.com

9–13 **London**
Informing the World on Corrosion Control
Details: NACE International, UK
Tel: +44 (0)1635 202329
e: CBrit79727@aol.com

10–11 **London**
Production Sharing Agreements/Host Government Contracts
Details: IBC Global Contracts Ltd, UK
Tel: +44 (0)20 7453 5491
Fax: +44 (0)20 7636 6858
e: cust.serv@ibcuk.co.uk

10–12 **Brussels, Belgium**
Environmental Conference, Oil and Petrochemical Industries
Details: GTF, UK
Tel: +44 (0)1737 365100
Fax: +44 (0)1737 365101
e: events@gtforum.com
www.gtforum.com

10–13 **Cranfield, UK**
Pumps and the Plant Design Engineer
Details: Cranfield University
Tel: +44 (0)1234 754766
Fax: +44 (0)1234 751875
e: pase@cranfield.ac.uk

11
'Digital Black Gold' – E-commerce in the Oil and Gas Industry
Details: Pauline Ashby, The Institute of Petroleum

11–12 **London**
Worldwide Deepwater Technologies 2000
Details: IBC Global Conferences, UK
Tel: +44 (0)20 7453 5491
Fax: +44 (0)20 7636 6858
e: cust.serv@ibcuk.co.uk

11–12 **Tunis, Tunisia**
Mediterranean Gas and Power 2000
Details: Overview Gas Conferences
Tel: +44 (0)20 7650 1430
Fax: +44 (0)20 7650 1431
e: confs@economatters.com

11–13 **Amsterdam**
Gasification 4 the Future
Details: IChemE Conference Department
Tel: +44 (0)1788 578214
Fax: +44 (0)1788 577182
e: jblack@icheme.org.uk

12–14 **Florida**
5th Annual Energy Trading Summit
Details: Barbara Wolf, Global Change Associates
Tel: +1 212 625 8801
Fax: +1 212 399 3471
e: barbarawolf@global-change.com

15–16 **Muscat, Oman**
Land Tank and Shipboard Measurement
Details: Abacus International, UK
Tel: +44 (0)1245 328340
Fax: +44 (0)1245 323429
e: register@abacus-int.com

17–18 **Muscat, Oman**
Flow Metering and Meter Proving
Details: Abacus International, UK
Tel: +44 (0)1245 328340
Fax: +44 (0)1245 323429
e: register@abacus-int.com

17–20 **Manchester**
Geoscience 2000
Details: Maxine Winter, The Geological Society
Tel: +44 (0)20 7434 9944
Fax: +44 (0)20 7 494 0579
e: winterm@geolsoc.org.uk

18–20 **Rotterdam**
PetroTech 2000
Details: Ahoy' Beurzen bv, the Netherlands
Tel: +31 10 293 3145
Fax: +31 10 293 3149
e: pieter.simons@ahoy.nl

19 **Woodlands, Texas**
OPIS NGL Supply Summit 2000: New Fundamentals for a New Millennium
Details: Scott Berhang
Tel: +1 800 275 0950
www.opisnet.com

MAY 2000

8–9 **Abu Dhabi, UAE**
Middle East Refining Forum (MERF) 2000
Details: World Refining Association, UK
Tel: +44 (0)1242 529090
Fax: +44 (0)1242 582157

8–9 **Singapore**
Land Tank and Shipboard Measurement
Details: Abacus International, UK
Tel: +44 (0)1245 328340
Fax: +44 (0)1245 323429
e: register@abacus-int.com

8–11 **Birmingham**
Safety & Health at Work, Fire Expo, IFSEC
Details: Miller Freeman, UK
Tel: +44 (0)20 8987 7860

10–11 **Singapore**
Flow Metering and Meter Proving
Details: Abacus International, UK
Tel: +44 (0)1245 328340
Fax: +44 (0)1245 323429
e: register@abacus-int.com

15–26 **Aberdeen**
Integrated Environmental Management and Sustainable Development
Details: Cordah Ltd, UK
Tel: +44 (0)1224 414211
Fax: +44 (0)1224 414250
e: j.butler@cordah.co.uk

16–18 **Aberdeen**
Basic Principles and Practice of Flow Measurement
Details: National Engineering Laboratory, UK
Tel: +44 (0)1355 220222
e: stough@nel.uk

17–19 **Venice, Italy**
Corrosion in Refinery Petrochemical and Power Generation Plants
Details: AIM, Italy
Tel: +2 7602 1132
Fax: +2 7602 0551
e: aim@fast.mi.it

22–25 May
Pipelines 2000
Details: Interbuild 2000, UK
Tel: +44 (0)20 7505 6827
Fax: +44 (0)20 7505 6661

23 **Aberdeen**
Oil-in-Water Monitoring
Details: National Engineering Laboratory, UK
Tel: +44 (0)1355 220222
e: stough@nel.uk

23–24 **London**
OILOP 2000 – 2nd International Conference on Oil & Gas Trading and Shipping Operations
Details: Asdem Ltd
Tel: +44 (0)20 7493 0973
Fax: +44 (0)20 7499 5270
e: info@asdem.co.uk

IP Conferences and Exhibitions

International Conference on

'Digital Black Gold' – E-commerce in the Oil and Gas Industry

London: 11 April 2000

'E commerce has saved the corporation $1bn'
Jack Welch CEO of General Electric

Maybe you purchase books from **amazon.com** or groceries from Tesco on the Net, but how does this relate to making the oil and gas industry more efficient, cost effective and competitive in managing the supply and customer chain?

The IP Conference 'Digital Black Gold' brings together expertise from industry users, the facilities and services available from specialist Internet companies, analysis of financial and legal obstacles and initial findings of energy companies.

This conference is aimed at managers who need to understand the implications of e-commerce for their business and those involved in implementing e-commerce strategies, rather than IT specialists.

Sir John Browne has said that 95% of BP Amoco's procurement will be via the Internet by the end of 2000! Perhaps you should be there!

Exhibition Opportunities
We would also like to offer you the opportunity to book exhibition space in connection with this timely conference. The exhibition will be located where all teas, coffees and lunches will be served to delegates.

Sponsorship Opportunities
Sponsorship opportunities include:
- Buffet Lunch
- Advertising in Published Papers
- Conference Documentation
- Briefcase Insert

The programme and registration form is now available.

Annual Introduction Courses

Oil Industry Operations Course
14–16 June 2000

Petroleum Economics
19–21 June 2000

Both courses will be held at the Institute of Petroleum

The programme and registration forms will soon be available.

International Conference on

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 it being is organised by the **Institute of Petroleum**. It is planned that **INTERSPILL 2000** will be the first in a regular series of such events.

Topics to be covered

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

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

Who should attend?

INTERSPILL 2000 will be of interest to all who are concerned about the environment and those involved in its protection, including:
- national and international environmental agencies
- oil, chemical, and transport industries
- port and harbour authorities
- offshore oil field operators
- central and local authorities
- emergency services

For exhibition package and further conference details, please contact the numbers below.

For further information 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

IP Discussion Groups & Events

London Branch

AGM followed by 'Energy and Emissions Issues'

Thursday 27 April, 14.15 for 14.30
Park Royal Brewery, London NW10

David Parker, Power Station Manager, Guinness

Numbers will be limited

Contact: Carol Reader Tel: +44 (0)20 8852 9168

Nominations for committee members must be received by the London Branch Secretary at the IP, 7 days prior to the AGM.

IFEG **Information for Energy Group**

Electronic Journals for the Energy Industries

Afternoon Seminar, 2pm to 5pm,
Wednesday, 10 May 2000
Institute of Petroleum, 61 New Cavendish Street,
London, W1M 8AR

This afternoon seminar will focus on the availability of electronic journals for the energy industries – what they are and how to obtain them and their benefits over printed formats.

This is your opportunity to hear some of the producers and suppliers of these journals, quiz them on what they offer and give them back your opinions.

Speakers and organisations will include:
Harts E&P Group, FT Energy On-line, Swets, British Library Web Inside, Everetts

Admission free to IFEG members, £20 to non-IFEG members.
A light lunch will be available before the seminar. Please let us know you are coming.
For more details contact Catherine Cosgrove on 020 7467 7111 Fax: 020 7255 1472; e: **lis@petroleum.co.uk**

IP THE INSTITUTE OF PETROLEUM

Branch Activities

Aberdeen
Contact: *George Wood*
Tel: +44 (0)1224 205736
11 April: Alternative Energy Resources by Prof Bryden, Robert Gordon University
9 May: Forties Pipeline System into the Next Century by Ian Cansfield, BP Amoco

Humber
Contact: *David Hughes*
Tel: +44 (0)1469 555237
13 April: Ladies' evening. Antiques Roadshow
11 May: Visit to Humber Tugs, Howard Smith Towage

London
Contact: *Carol Reader*
Tel: +44 (0)20 8852 9168
27 April: AGM and visit to Guinness Brewery

North East
Contact: *John Sparke*
Tel: +44 (0)1642 546411
20 April: The Work of the Environment Agency, discussion led by Sarah Gayton, Environment Agency
16 May: Visit to the Virtual Reality Centre, University of Teeside

Southern
Contact: *Veronica Cloke Browne*
Tel: +44 (0)1703 896303
(April): Future of Chemical Engineering (jointly with IChemE)

Stanlow
Contact: *John Wellsteed*
Tel: +44 (0)151 479 4962
13 April: The Oil Industry and the Environment by Martin Maeso, IP Environment Manager, and a speaker from the Environmental Agency
18 May: Visit to Vauxhall Motors engine plant, Ellesmere Port

Energy, Economics, Environment Discussion Groups

Please notify the contacts if you plan to attend any of the advertised events

All events will take place at the IP unless stated otherwise

Institute of Petroleum
61 New Cavendish Street
London W1M 8AR, UK
Tel: +44 (0)20 7467 7100
Fax: +44 (0)20 7255 1472
e: jsandrock@petroleum.co.uk

MOVES People

Pipeline Engineering has appointed **David Bacon** to the position of Special Projects Director. He will be working on projects such as unique pipeline pigging and isolation solutions. He has previously worked for companies including BP, Shell, Brown and Root and Halliburton. **Nigel Baxter** has been appointed Regional Account Manager for the Middle East and **Jane Breen** joins the company in the role of Shipping Co-ordinator.

Christian Cléret, Managing Director of Elf Oil UK Ltd and President of the UK Petroleum Industry Association (UKPIA) has stepped down eight years after his arrival in the UK from the Elf Aquitaine Group. His decision follows the merger of Elf and TotalFina. Control of Elf Oil UK passed to **Gary Jones**, Managing Director of TotalFina GB on 1 March.

Dr John Lynn has been named Managing Director, Texaco Ireland, effective 1 May. Lynn will replace **Martin Finnegan** who has been appointed Vice President, Texaco International Marketing and Manufacturing (TIMM) Benelux and West Africa Regions. **Stephen King** will replace Lynn as General Manager, Retail Sales, Texaco Ltd. **James R Hawn** will become the Regional Vice President of TIMM for the UK and Ireland Region and Managing Director, Marketing and Manufacturing, Texaco Ltd, which are effective 1 May. Hawn will relocate from Texaco's Brussels office to London.

Dermot Coady **has joined Rotork Control & Safety as Sales and Marketing Director. Coady joins the company from Fisher Rosemount and has over 20 years experience of the process control industry.**

Fabrication company UiE Scotland has appointed **Neil Rosie** to succeed **Tom Preston** as Marketing Manager. Rosie joined the company in 1997 as Estimating Manager having previously spent three years working for Lithgows Ltd.

Robert J McGuire will join the Chase Manhattan Corporation as Managing Director and Head of the Oil and Gas group in Europe, Africa and the Middle East, effective 1 April.

Willi Loose has been named President of Honeywell Europe, Middle East & Africa. This follows closure of the merger of Honeywell with AlliedSignal in December 1999.

Pierre Vaillaud has resigned his position as Chairman and CEO of the Elf Aquitaine Group following the European Commission's approval of the merger between Elf Aquitaine and TotalFina. He remains a member of the Board. **Thierry Desmarest**, Chairman and CEO of TotalFina has been elected to the Board of Elf Aquitaine and then as its Chairman and CEO.

ASTM has announced a new 2000 Board of Directors. They are: **Harvey P Hack**, Chairman; **Richard J Schulte**, Vice Chairman; **W James Bover**, Finance and Audit Committee Chairman; **Jeffrey I Enyart**, Director; **Stephen W Hopkins**, Director; **Lisa A Johnson**, Director; **Helene Hardy Pierce**, Director; **Leslie Smith**, Director; **N David Smith**, Director.

Roy Hartley **has been appointed Regional Director of the Asia Pacific Region for Helix Well Technologies Pty Ltd. His role is to oversee all services carried out from the company's new base in Perth, Western Australia. He joined the company after seven years as a Director of Troy Petroleum Management Services Ltd which he co-founded in Windsor, England in 1992.**

Dave Smith, President of Marathon Oil UK becomes President of the UK Offshore Operators Association (UKOOA) effective 1 April. He is replacing **Francis Gugen** who relinquishes the Presidency on his departure from Amerada Hess.

Global Marine Inc has elected **Carroll W Suggs** to the company's Board of Directors. Suggs is Chair, President and CEO of Petroleum Helicopters Inc, which provides helicopter transportation services to companies engaged in the offshore oil and gas industry.

Paradigm Geophysical Ltd has made several senior staff appointments. **Larry Lenig Jr** has assumed his appointment as President of Paradigm's US operations, replacing **Steve Goldsberry**. Goldsberry has been appointed to head the newly formed Product Business Group. Lenig joins from Grant Geophysical Inc where he served as President and Chief Executive Officer. **John Dinning** joins the company as Vice President of Client Solutions, US Operations from Vice President of Sales, GeoQuest, North America.

The Board of Directors of Global Marine has elected **Thomas R Johnson** as its Senior Vice President as well as Chief Administrative Officer. Johnson was previously the company's Vice President and Corporate Controller. **Douglas C Stegall** will succeed Johnson in his previous role.

New members to the Board of Directors of GALP – Petróleos e Gás de Portugal, SGPS, SA have been appointed. President is **Henrique Bandeira Vieira** with the following members: **Dr António Luís Guerra Nunes Mexia**; **Manuel Ferreira De Oliveira**; **Carlos Eugénio Magalhães Corrêa da Silva**; **José Fragosos Gomes Rebelo**; **Giancarlo Rossi**; **Mário Cristina de Sousa**; **Emílio Rui da Veiga Peixoto Vilar**; **Professor Doutor João de Deus Rogado Salvador Pinheiro**; **Pedro Mar Guimarães José de Mello**; **Dr Jorge Manuel Valente Santos Silva**.

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Web World

Another area that is rapidly becoming an e-business is the trading of steel and metal products. **SteelScreen.com** claims to be the leading Internet-based marketplace for metal products in Europe. The site is multilingual, featuring eight European languages. The company has recently signed a Memorandum of Understanding with **iSteelAsia.com**, which offers a similar Internet service for the Asia-Pacific market, to explore joint developments.

yet2.com – claimed to be the first global online marketplace for the exchange of technology intellectual property – has announced a group of major European corporations who will be trading their innovation assets on **www.yet2.com** The companies include Shell Global Solutions, the technology arm of Shell; automotive equipment supplier Bosch; chemical companies BASF and Ciba Speciality Chemicals; electronics and electrical systems companies Philips and Siemens and imaging technologies specialist, Agfa-Gevaert Group. As a group, the European companies are reported to account for around 10% of total corporate expenditure on research and development in Europe.

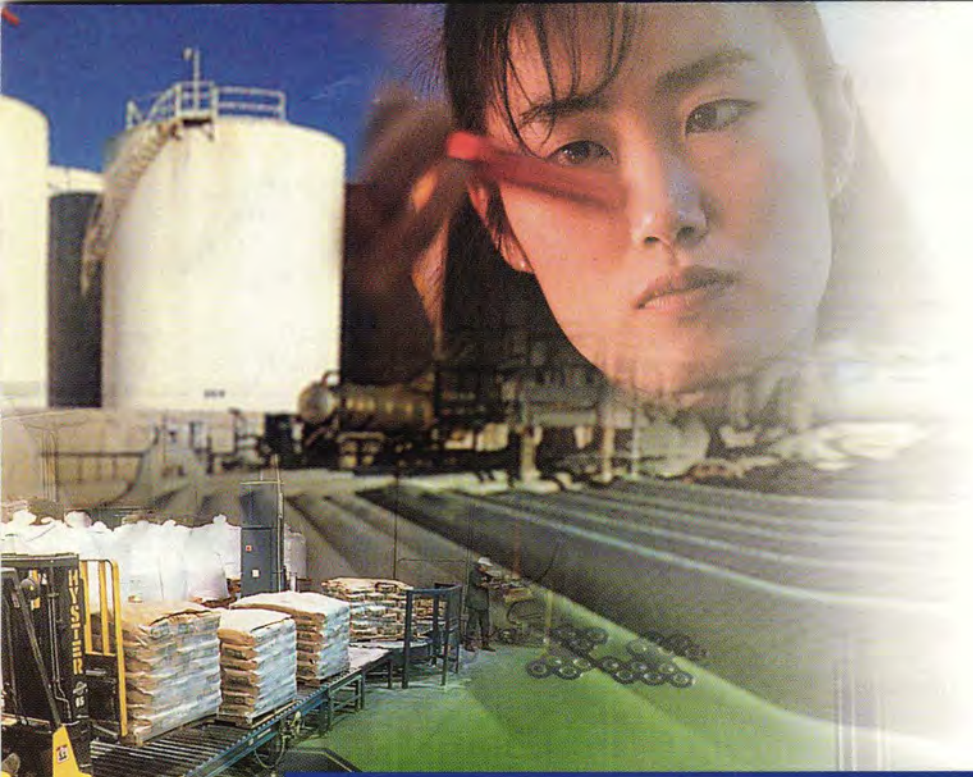
Aspen Technology has launched a new Internet portal for the process industries. **ProcessCity.com** provides process industry-specific news and event information, professional discussion forums and access to online applications, consultant expertise and solution providers.

Meanwhile, Oracle and Novistar have formed a strategic alliance to develop what they claim will be 'the broadest range of e-business products and services to the energy industry.' Novistar will own and market the widely used Oracle Energy Upstream suite of products, said to be the industry's only Internet-enabled solution for production planning, operations and accounting. Oracle will complement Novistar's efforts and continue to serve the energy marketplace by offering its core technology, and e-business solutions such as Internet Procurement, Customer Relationship Management and Oracle Exchange.

www.pennNet.com has unveiled plans to build a B2B Internet marketplace based on Ariba's B2B eCommerce platform and dynamic pricing and auction applications to facilitate the trade of producing oil and gas assets and oilfield equipment-related services.

Vopak has launched a new sales and marketing Internet site – **www.chempoint.com** – for chemical products and services which will initially focus on speciality, fine and semi-commodity chemicals that typically have a long selling cycle and involve product qualification and/or extensive technical support.

Chevron, McLane Company (a subsidiary of Wal*Mart) and Oracle have unveiled plans to create a joint venture called **RetailersMarketXchange.com** – an independent company which will offer what is claimed to be the first Internet trade exchange designed as a full-service marketplace for all convenience store and small-business retailers and their suppliers. It is planned to bring the service online in summer 2000.



The Global Network

With the world's biggest network of terminals, tankers and tank containers, Vopak covers most aspects of the logistics chain in the chemical and oil industry. Vopak is world leader in chemical distribution with a network of warehouses, customers and end-users in North America and Europe. We meet the needs in the industry to outsource logistics by providing fully integrated services like supply chain management and industrial terminalling.
The truly global scale allows Vopak to be cost-effective. In combination with the high standards in safety, health, environment and quality, Vopak is *the* partner in logistics and distribution.

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Vopak

The link between producer and end-user of chemicals and oil products