PETROLEUM REVIEW

THE INSTITUTE OF PETROLEUM

February 1997

Towards 2020
The oil and gas potential from the UK offshore

Geochemistry
Chemical tracking of secondary oil migration

Cadman Medal
Sir David Simon CBE to receive prestigious award

Learning society
A new direction for the IP

IP
THE INSTITUTE OF PETROLEUM

IP Week Conferences

IP Week is the focal point in Europe when leading figures in the oil and gas industry migrate to London for an intensive round of conferences, industry and trade association events, company meetings and social functions. The Institute's own programme of events is the central focus for these activities.

Monday 17 February

Financing the International Oil Industry — The Continuing Challenge

The provision of finance to meet the massive capital investment requirements of the next decade represents one of the greatest challenges facing the international oil and gas industry. This international conference will address the key issues including international equity and debt markets, complex financings and asset-based finance as sources for the oil industry, financing the reconstruction of the energy industries in the Former Soviet Union and oil trade finance.

Speakers include:
- Mr Steve Lucas, British Gas plc
- Mr Andrew Shilston, Enterprise Oil
- Mr Ronald Freeman, European Bank for Reconstruction and Development.

Tuesday 18 February

The 10th Oil Price Seminar: Managing the Short-Term Risk

The annual IFEG Oil Price Seminar examines the information used to predict future movements in the price of crude and refined oil products and addresses the techniques available to handle short-term risk. This important seminar offers risk managers, traders, marketers, analysts, information providers and forecasters the opportunity to hear the latest expert opinion and to sample the most up-to-date information services.

Speakers include representatives from an oil major, a trader and a specialist derivatives company.

Thursday 20 February

Achieving Competitiveness through Innovation and Value Engineering — How Lessons from the Upstream Can Be Applied to the Downstream and Beyond

'ACTIVE' seeks to adopt the principles learnt in the offshore and other industries, to bring about a similar step-change in practices in the process industries and achieve a commensurate reward in terms of overall long-term competitiveness. This conference will review the lessons so far from CRINE, while enterprises that have already applied this radical approach to downstream activities will report on their experiences and successes.

Chaired by Sir Alan Cockshaw, Chairman, AMEC plc

Speakers include:
- Mr Tim Eggar MP, former UK Minister of Industry and Energy
- Mr Arthur McQuillan, Director, ACTIVE
- Mr John Wils, Director, Aberdeen, UKOOA

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The Institute of Petroleum in London

News in Brief

9 December

The UK Department of Trade and Industry is to provide the Indian Directorate General Hydrocarbons India advice on oil and gas policy and regulation, exploration and licensing, field development production and decommissioning and use of information technology, as well as access to UK company expertise via the Oil, Gas and Petrochemicals Supplies Office, under the terms of a new Memorandum of Understanding.

10 December

Amoco has completed its fourth consecutive gas discovery on the Ras el Barr offshore concession in the Nile Delta. The Osiris East-1 well tested at a rate of 35 mncuft of gas per day and 2,275 barrels of condensate per day.

11 December

Statoil has awarded Geco Prakla a contract worth NOK150-200m for 3D seismic surveying of the Norwegian, Danish, British and Irish continental shelves. Work is due to start in the southern North Sea in February.

12 December

The UK Export Credits Guarantee Department has underwritten $45m of loans to state-owned Qatar General Petroleum Corporation and Mobil Qatargas Inc as part of a financing package for the development of a major LNG export production facility in Qatar. The site will handle product from the offshore Khuff gas reservoir.

13 December

British Gas has secured a 50 percent interest in the Ulysse permit in the Gulf of Gabes, Tunisia. National oil company Enterprise Tunisienne d'Activites Petroleum holds the remaining 50 percent stake in the permit which lies close to British Gas' producing Miskar gas field, as well as the Ashtart oilfield and the Hasdrubal gas discovery.

Texaco Fuel and Marine Marketing has purchased the Minemet UK fuel oil terminal in Cardiff which has a current throughput of some 400,000 tonnes of fuel oil per annum. The new venture will be known as Minemet Fuels.

Mobil North Sea Ltd has taken Elf Exploration UK's interests in an area close to the Mobil-operated Beryl field in exchange for the release to Elf of a 16.5 percent stake in block 22/30b which contains part of the Elgin field. The agreement gives Mobil 15 percent of blocks 9/10b, 9/14a and part of 9/15a as well as a 66.7 percent interest the Peik field which lies in the remaining part of block 9/15a.

The UK Department of Trade and Industry has issued an Open General Licence to Communicate with Iraq for civilian supplies and pipeline parts deemed essential for the safe operation of the Kirkuk-Yumurtalik pipeline. Companies will still require individual export licences, however, which must be approved by the United Nations.

16 December

Repsol has strengthened its presence in Peru with the acquisition of 60 percent of Solgas, Compañía Peruana de Gas for $39m. The company – which holds a 40 percent share of the Peruvian LPG market – operates a number of bottling plants as well as the logistics company Energas and a recently built import product terminal at Ventanilla.

Clyde Petroleum is to acquire BP and BHP's entire equity in blocks 9/14b East and West on the UK Continental Shelf for £4.25m in cash and a further £4.25m on first production. BP holds 91.18 percent in 9/14b East and 82.36 percent in 9/14b West, while BHP holds 8.82 percent in 9/14b East and 17.64 percent in 9/14b West which contains an Eocene oil discovery thought to hold oil reserves in the region of 20 million barrels.

Lasmo's EKT-1 exploration well in block 208 in the Ghadames Basin, Algeria, has flowed at sustained rates of 13,568 b/d and 8.8 mncuft/d. Its EME-2 well, also in block 208, tested at 11,176 b/d and 13.9 mncuft/d.

Texaco North Sea UK Company and BP Exploration have signed contracts to bring ashore crude oil by shuttle tanker from Texaco's Captain field, due on stream in early 1997, to BP's Nigg Bay facility in the Cromarty Firth. BP's interest in Nigg Bay is being bought by Talisman Energy (UK) Limited, which is expected to take over as operator in early 1997.

17 December

Energy Africa has sold Heritage Oil & Gas Limited its 100 percent shareholding in Eagle Energy (Oman) Limited, which holds a 10 percent interest in the offshore Bukha gas condensate field, for $7.4m.

18 December

Arco Transportation Alaska Inc has announced plans to purchase some 25 percent of Mobil Alaska Pipeline Company's 4.08 percent interest in the Trans Alaska Pipeline system for $14.1m.

19 December

Aberdeen-based Consolidated Supply Management and the State Oil Company of Azerbaijan are to form a joint venture company in Azerbaijan – Caspian Logistics Services – which will promote, develop, operate and manage the existing marine supply base at Primorsk. It will also develop a greenfield site adjacent to the port area as a multi-customer vendor park.

Arco has increased its investment in China's Zhenhai Refining and Chemical Company with the $128m purchase of 64 percent of a convertible bond offering. Net proceeds from the offering will fund a third-phase expansion of the plant that will significantly increase Zhenhai's refining capacity.

Pogo Producing Company's subsidiary Thaipo Limited is to purchase a 46.34 percent share of Maersk Oil (Thailand) Ltd's interest in the block B8/32 concession in the Gulf of Thailand.

Fluor Daniel and Mitsubishi Heavy Industries have received an order for project specification preparation work for Malaysia's third liquefied natural gas project. When fully operational, the new plant – owned and operated by Malaysia LNG Tiga Sdn Bhd – will produce 6.8m tonnes of LNG annually.

20 December

Repsol Exploration UK Ltd is to sell its 5 percent stake in UK blocks 211/7a and 211/12a – including the Magnus field and its satellites South Magnus and Northwest Magnus together with related interests in the regional oil and gas transmission and distribution system – to Nippon Oil Exploration and Production UK Ltd.

Statoil Shipping & Marine Technology, together with Advanced Production Systems and Bergesen, has secured the NOK30m front-end engineering design contract for the North Sea Pierce field operated by BP. The field will be developed utilising the multipurpose shuttle tanker *Berge Hugin* (50:50 owned by Statoil and Bergesen) as a production vessel. Due onstream in summer 1998, the field is expected to produce some 45,000 b/d.

Ramco Energy has signed a letter of intent with the Ministry of Fuel and Energy of the Republic of Georgia to explore and develop a block situated in the Kekhetia district of northeast Georgia. Ramco is to form a joint venture with Saknavtobi, the Georgian State Oil Company, the Oil & Gas Producing Department of the Georgian Fuel and Energy Ministry under the terms of the arrangement.

The Fossil Fuel Levy in Scotland is to be increased by 0.2 percent to 0.78 percent from 1 April 1997.

News in Brief

23 December

Elf Aquitaine has sold its remaining 10 percent interest in Compagnie Générale de Géophysique to ISIS, whose principal shareholder is the Institut Français du Pétrole, as well as 3.6 percent of the capital of Coflexip Stena Offshore. The oil company also sold 500,000 shares in Technip on the stock market, reducing its remaining interest to 6.2 percent.

Ranger Oil is to purchase an additional 29.29 percent interest in the Ranger-operated Anglia gas field in the North Sea from Amerada Hess, increasing its total holding to 67.2 percent.

24 December

British-Borneo Petroleum Inc is to assume operatorship and a 100 percent working interest in Shell Deepwater Development Inc's contiguous blocks Mississippi Canyon 502, 503 and 546, which include the Leo discovery, in the Gulf of Mexico.

27 December

Repsol Exploración has discovered a new gas and condensate field on the Khalda concession in the Western Desert of Egypt. The TUT-22 discovery well tested at 90 mncuft of gas and 4,000 barrels of condensate per day.

1997

2 January

Russian-registered oil tanker *Nakhodka* has broken in two during storms in the Sea of Japan and oil slicks from the 19,000 tonne cargo now threaten the coastline of northwest Japan. It is reported to be Japan's second worst oil spill.

3 January

Repsol has acquired a 45 percent stake in Pluspetrol Energy for $340m via its affiliated company Astra, in which Repsol holds a 37.7 percent controlling interest. Pluspetrol operates and owns 60 percent of the Ramos gas field in northwest Argentina.

7 January

British-Borneo Petroleum Inc has concluded an agreement to farm in to the BP-operated Nirvana oil prospect on Mississippi Canyon blocks 162 and 163 in the Gulf of Mexico.

8 January

The Khalda Group (comprising Repsol, Apache and Samsung) has signed a 10-year sales contract with Egyptian General Petroleum Company under which the Khalda concession in the Western Desert of Egypt will produce 200 mncuft/d primarily for use in power generation for projects to be developed in the Alexandria area.

The Petroleum Authority of Thailand and the Electricity Generating Authority of Thailand have signed a 20-year natural gas sales agreement covering the purchase of 1 mncuft of gas per day.

9 January

Gulfstream Resources Canada Limited has announced that the Sukatani #1 well on the island of Java in Indonesia tested at a constrained rate of 8.9 mncuft/d. A 3.5-km pipeline tie-in to the West Java sales/distribution system is currently being designed and negotiations for a gas sales contract are underway.

Amoco Canada Petroleum Company has announced that Lazard Freres & Co LLC of New York has been retained as financial adviser to explore strategic alternatives, including a possible sale, for its marine drilling and services division Canadian Marine Drilling.

Chevron Shipping Company is to acquire two newbuild, double hulled tankers from Samsung Heavy Industries Co in Korea as part of an ongoing fleet renewal programme. The new tankers are due to be delivered in late 1998 and early 1999.

13 January

Total has signed a production sharing agreement on the Lenkoran-Talysh Deniz permit in Azerbaijan. Elf will act as operator with a 65 percent interest, Socar (25 percent) and Total (10 percent).

Computalog of Calgary and Paris-based Geoservices Group have announced that they plan to establish a joint venture combining their respective North American drilling services operations.

International Bioremediation Services has gained approval from the Nigerian Department of Petroleum Resources for the use of its bioremediation technology and products on oil contaminated sites in the Niger Delta. IBS has also been awarded a major contract to remediate two sites in Beneboye and Brass which were subject to accidental oil spills.

14 January

Mobil in the United States has cancelled a contract to buy half of the first shipment of Iraqi crude because the tanker carrying the cargo has been delayed.

Lamprell's Sharjah shipyard in the United Arab Emirates has secured a major rig refurbishment contract from Houston-based Marine Drilling for its recently purchased *Marine 305* jack-up drilling rig.

15 January

Lasmo has acquired new acreage in Pakistan. The Bela South and Bela North concessions lie to the west of Karachi in Baluchistan Province, while the third block, Kirthar West, is adjacent to the company's existing Kirthar concession in Western Sindh.

Total Oil Great Britain is to purchase 18 of Oakstead Holdings' UK service stations. Two of the outlets are virgin sites, the remaining 16 are operational.

Lamprell and Norwegian Maritime Hydraulics Company are to open a Maritime Hydraulics Middle East regional office inside Lamprell's Sharjah port facility.

16 January

Occidental Petroleum and Unocal have signed a farm-in agreement which will transfer to Unocal a 50 percent interest in Occidental's production-sharing contracts covering 3 million acres in northeast Bangladesh, including the Jalalabad gas field in blocks 13 and 14.

Chevron has reached an agreement in principle to sell 10 percent of its interest in the Tengizchevroil joint venture in Kazakhstan to Lukoil.

Lasmo and its co-venturers report that the Gorgoglione-1 appraisal well in the Tempa Rossa field in southern Italy flowed at rates of up to 6,725 b/d of 20.3° API oil.

Agip has signed an agreement with the government of Gabon to develop the offshore Limande oilfield.

UiE Scotland has secured the contract for completion work on Esso Norway's Balder floating production unit following the recent signing of a 10-year lease on the Inchgreen yard at Port Glasgow on the lower Clyde.

17 January

Atlantic Richfield Indonesia has awarded a 7,500 line kilometre airborne gravity and magnetic survey over Babo PSC in Irian Jaya to Carson Aerogravity.

Shell has announced that substantial investments are planned over the next five years in a bid to develop a global electricity business based on its gas and coal reserves.

Racal has acquired 60 percent of Paris-based geotechnical services company Geodia and has an option to buy the remaining balance.

20 January

Total and Yemen Gas Company, the present shareholders of Yemen LNG Company, and the Ministry of Oil and Mineral Resources of Yemen have signed a set of agreements with companies which have interests in the Marib area, providing for their entry ino the shareholding of Yemen LNG Company.

Newsdesk

Mobil renegotiates 'take-or-pay' North Sea gas contracts

Mobil has renegotiated its 'take-or-pay' North Sea gas contracts following hot on the heels of the renegotiated terms agreed with British Petroleum (see *Petroleum Review*, January 1997). As a result of the new agreement, Centrica, through its subsidiary British Gas Trading, will reduce its long-term commitment to purchase gas volumes from Mobil through the termination of two contracts. Prices will also be reduced to market levels on a phased basis on three other contracts during the next few years.

The agreement allows British Gas Trading to reduce its price and volume commitment on some 10 billion therms.

In consideration for the agreement, British Gas plc will, subject to normal regulatory approval, transfer to Mobil North Sea Limited producing and transportation assets in and around the Beryl field. These assets comprise 5 percent on the Beryl field, 29.5 percent of block 9/12a in the Nevis field and 2.5 percent of the Scottish Area Gas Evacuation system. In all, the assets provide Mobil with an extra 27 million barrels of oil equivalent (boe) in reserves and increase daily oil and gas production by approximately 9,000 boe.

Shell refinery sale

Shell put its refinery at Cressier in Switzerland up for sale at the close of last year in a bid to improve performance in the Western European refining sector, a market which has increasingly been delivering 'inadequate returns' in recent months. In addition, the company also announced that efforts to improve the profitability of the Shell Haven refinery in the United Kingdom would continue, as would the ongoing evaluation of the group's refinery needs in southeast France in conjunction with the industry under a study supported by the French Ministry of Industry.

A major rationalisation and upgrade of lubricants production facilities in France and Germany is also planned to create a more integrated operation.

Shell currently has 14 refineries in Western Europe, of which 11 are fully owned. Group refining capacity is 1.6 million barrels per day; market share is 13 percent.

Sullom Voe secures Schiehallion deal

Sullom Voe oil terminal in the Shetland Islands is to handle the crude oil produced from the Schiehallion field. Subject to the satisfactory outcome of final negotiations, British Petroleum and field partners Amerada Hess, Murphy, OMV, Shell and Statoil will use the BP-operated terminal for a minimum period of five years.

The field is due onstream in mid-1998. Crude oil will be exported in a new purpose-built, BP-operated 125,000 tonne shuttle tanker currently being built by Daewoo in Korea.

Some £10 million is to be invested in equipping the terminal to handle Schiehallion oil, including the refurbishment of up to four storage tanks and the recommissioning of jetty 3 which will mark a return to the full four-jetty operation. Most of the work will be undertaken this year, although some may spill over into early 1998. Handling Schiehallion's oil will make a valuable contribution to the terminal's overhead costs, further helping to improve the terminal's economic competitiveness.

Sullom Voe terminal. Photo courtesy of BP.

Phillips to operate coalbed methane concession in China

Phillips China Inc, a subsidiary of Phillips Petroleum Company, and CBM Energy Associates (CBMEA) have signed an agreement making the former the majority interest owner in, and the operator of, the Hedong joint venture coalbed methane concession in Shanxi Province, China.

The Hedong concession is located in the eastern Ordos (Hedong) Basin approximately 120 miles west of Taiyuan, the capital of Shanxi Province, and covers 781,000 acres. The city of Taiyuan lies 260 miles southwest of Beijing. Phillips will be assigned a 65 percent interest in the concession, with the Chinese partners holding a 30 percent stake and CBMEA the remaining 5 percent.

Seismic and drilling operations are scheduled to commence early this year.

The deal marks the company's first opportunity to explore for and produce hydrocarbons onshore China, a country in which 'Phillips has growing interests', according to Bill Berry, President, Phillips China Inc. The Beijing-based company currently operates the Xijiang oilfields in the South China Sea and an exploration permit in Bohai Bay. It is also building a £220m per year ethylene plant in Shanghai with co-venturer Shanghai Petrochemical Company Limited.

New Years Honours list

Sir Robert Baynes Horton, Chairman, Railtrack, and former Chairman and Chief Executive Officer, British Petroleum Company plc 1990-93 (below)

Sir John David Rowland, Chairman, Lloyd's of London

Anthony Albert Denton CBE, Chairman, Noble Denton

Clive Lawson Jones CBE, former Secretary-General, European Energy Charter, DGXVII

Edward John Meldrum Ball OBE, former Director, Oil Companies International Marine Forum

Michael Collingwood Roberts OBE

Kenneth Speakman OBE, former Pollution Inspector, Environment Agency

William Charles Boddy MBE, founder and former Editor, *Motor Sport*

Geoffrey Michael Day MBE

Gordon Charles Hay MBE, Gas Engineer

Desmond Heard MBE, Gas Engineer

Howard Leslie Jones MBE, Maintenance Technician, Stanlow Manufacturing Complex, Shell UK

George MacLean MBE, former Manager, Air Traffic Service, Sumburgh Airport (Shetland), Civil Aviation Authority

Martyn Edmund Thomas MBE, Managing Director, Sulzer (UK) Pumps

Newsdesk

Release of areas offshore Australia

More than 30 new exploration areas offshore Australia are being considered for release in 1997. Most of the areas are in the Browse and Bonaparte Basins offshore Western Australia and the Northern Territory. The other areas lie in the Duntroon Basin (offshore South Australia), the Gippsland Basin (offshore Victoria) and the Sydney Basin (offshore New South Wales).

All the areas have received some exploration in the past but many are only lightly drilled and most are deemed 'under-explored'.

The regions have been flagged early in response to industry requests to allow a greater lead time for assessment of available information as well as to allow speculative seismic acquisition.

A formal release announcement, which may include deletions or additions to the areas outlined here, is expected in April.

Norwegian gas to be shipped to Ireland

Statoil, Total Norge and Norsk Hydro have agreed a one-year contract with Bord Gais Eireann to supply 264 million cubic metres of gas to the Republic of Ireland.

The gas will come from the Frøy field in the Norwegian North Sea and be piped through Norway's Frigg line to St Fergus in Scotland. Statoil's Alliance Gas subsidiary will then transport the gas to the UK national balancing point, from where it will be shipped to Moffat in Scotland for onward transport through the UK-Irish Interconnector line.

The sales contract covers about 75 percent of 1997 production from the Frøy field. The remainder has been sold by Elf under under a separate contract.

A Statoil spokesperson confirmed that the deal does not have any implications on discussions regarding the export of additional Norwegian gas through the the Frigg pipeline to the United Kingdom.

Feasibility study in Western Siberia

Brown & Root Energy Services is to undertake a feasibility study of the Myldjinskoye gas/condensate field development project in Western Siberia for Tomskgaz, the sister company of Russian Gazprom and Eastern Petroleum Company.

Myldjinskoye, located some 550 km northwest of Tomsk, will mark the first of a number of fields in the area to be developed by Tomskgaz in a drive to improve local gas supply, open up the local infrastructure and generally improve development in the southern part of Western Siberia.

Initial reviews from the study indicate that development of the Myldjinskoye field is indeed viable.

Other consortium members involved in the study include Smedvig and Instanes/SMS.

New Zealand focus on coalbed methane

With the evolving technology of demethanation and the presence of deep coal and/or deep abandoned underground workings both in the Huntly coalfield in North Island and Greymouth coalfield in South Island, the Coal Corporation of New Zealand Ltd sees coalbed methane as an important potential energy source.

Indeed, the company was recently awarded New Zealand's first onshore acceptable frontier offer (AFO) for coalbed methane. The five-year exploration permit, PEP 38603, covers an area of some 32 square kilometres in Waikato coalfields in North Island. Coal Corporation has also secured petroleum exploration permit PEP 38507 for coalbed methane near Greymouth.

OMV strengthens European gas hub

OMV has further strengthened its role in the European gas hub with the signing of an extension to its gas transit contracts via the West-Austria Gasline (WAG) with Gaz de France and Ruhrgas up to and including the year 2014.

The WAG runs from OMV's main gas centre in Baumgarten in Lower Austria to Oberkappl in Upper Austria. The pipeline system carries natural gas from Russia and Norway to the Austrian market, as well as transporting gas to Germany and France, and has a capacity of some 5 billion cubic metres (bncum). The existing contracts were due for renewal in 1999.

OMV has already extended its gas transit agreements with Snam spa, covering gas supply to Italy via the Trans-Austria Gasline (TAG), to 2012. This system connects Baumgarten via Styria to Arnoldstein in Carinthia. By the end of this year its capacity will have been increased in phases from 17 bncum to 22.5 bncum per year.

In recent years, gas consumption in Europe has, and continues to increase and a number of new gaslines have opened as a result. For example, the Hungaria-Austria Gasline, which runs from Baumgarten to Györ, became operational in October last year, as did the first part of the Penta West Gasline to Burghausen in southern Bavaria. The March-Baumgarten Gasline, connecting Baumgarten to the Slovakian storage facilities at Lab, is scheduled to come onstream later this year.

Development plans for Oseberg

Norsk Hydro, as operator and on behalf of the partners in licenses 079, 104 and 171 in block 30/9, has submitted a plan for development and operation of the Oseberg Syd field to the Norwegian Ministry of Industry and Energy.

It is proposed to develop the field as a satellite to the Oseberg Field Centre making extensive use of the existing infrastructure in the Oseberg area. The steel jacket platform will have a process capacity of some 14,900 cubic metres per day. The majority of wells will be drilled from the Oseberg Syd platform. However, those well targets that cannot be reached by extended reach drilling will be produced by subsea developments, reports Norsk Hydro. A total of 18 oil producers, four of which are planned in the northern part of the area and will be drilled from the existing Oseberg Field Centre, and 12 water and/or gas injectors are planned. Five wells will be pre-drilled.

Partly processed oil from Oseberg Syd will be transported by a 13-km pipeline to the Field Centre for further processing before being piped to Sture. Associated gas will be reinjected.

Recoverable reserves are estimated at 53.5 million cubic metres of oil and 11 billion cubic metres of gas.

Pending authority approval, first production is scheduled for February 2000 from the wells drilled from the Field Centre, and in August the same year from the new Oseberg Syd platform.

● Meanwhile, Norsk Hydro has also submitted a plan for the construction and operation of a NOK1 billion, 110-km long, gas pipeline from Oseberg to Statpipe in the Heimdal area in the 1999 pipelaying season.

Two alternative Statpipe connections are being proposed: direct connection to Statpipe just south of the Heimdal platform or to the riser at the platform already connecting Statpipe. A final recommendation will be submitted to the Norwegian Ministry of Industry and Energy before June following further evaluation of the two options by Norsk Hydro and the other partners in Oseberg Gas Transport.

Newsdesk

Dutch rivals collaborate in Chinese bulk storage terminal venture

Van Ommeren and Pakhoed are to combine their tank terminal projects in the port of Zhuhai, People's Republic of China. The two companies will each take a 47.5 percent stake in the new Vopak terminal. The remaining 5 percent will be held by China's Zhuhai International Engineering and Consulting Company.

The terminal is scheduled to start operations at the end of next year. Some $85 million is to be invested in the construction of 175,000 cubic metres of storage capacity for products, chemicals and gases in the first phase of development. This will be increased to 320,000 cubic metres in the second stage.

Zhuhai is located in the Pearl River delta and is one of the five special economic zones in the People's Republic of China. It is being developed into the leading bulk product port for southern China and is expected to become a main port for the storage of crude and crude products, chemicals and gases.

Van Ommeren and Pakhoed had initially planned to develop their own terminals at adjacent sites in the port. However, the location, size of investment and the potential for fast growth made the two traditional rivals decide to collaborate their efforts in this instance. The two companies stress that their co-operation will 'remain limited to the Zhuhai terminal'.

Pakhoed also has an interest in a terminal currently under construction in Xiamen in Fujian province, the first phase of which – comprising 100,000 cubic metres of storage capacity for mineral oil products – is due to become operational early this year. Van Ommeren, meanwhile, has interests in bulk storage terminals in Ningbo in the Shanghai region and Dalian in northern China.

Umoe Haugesund wins Troll C contract

Umoe Haugesund has beaten Kvaerner and Aker with its bid to secure the engineering, procurement and construction contract for the semi-submersible Troll C platform that will handle the production of additional oil reserves from the Troll field.

The NOK3.9 billion floating production unit contract is subject to the Norwegian authorities approving the field partners' plan for development and operation for the extended Troll oil production.

Umoe's bid is based on its UMOE/GVA 8000 platform concept. The unit will weigh in at approximately 24,000 tonnes, 15,000 tonnes of which will be accounted for by the topsides facilities for processing and living quarters. The platform will be anchored in 330 metres of water in the northern part of the Troll field. Tow-out is set for June 1999.

Total recoverable oil reserves from Troll are estimated to be in the region of 1.2 billion barrels. The Troll C platform will process the oil from the northern part of the Troll West gas province from six well groups totalling 32 wells. Platform production capacity will be 125,000 barrels per day.

Start-up is scheduled for September 1999.

UK oil/gas strategy for the millennium

The UK Department of Trade and Industry proposed a number of new initiatives aimed at boosting North Sea oil and gas production in the new millennium following a review of the UK offshore licensing system and consultation with industry late last year.

The proposals include the announcement this year of a programme of licensing rounds for the remaining years of this century, opening of all unlicensed areas to applications by companies in these rounds, encouragement of 'innovative' analysis of petroleum prospects by removing exclusive survey rights from future licences and considering measures to encourage licence holders to explore and develop their discoveries to avoid large licensed areas lying fallow. In addition, cash bidding is to be allowed but only in those few cases in which prospects or demands for blocks suit such an allocation method. An agreement on the 'White Zone', the area at the west of the UKCS on which discussions with the Faeroes continue on the location of the median line, is also planned.

● The closing date for applications for blocks on offer in the United Kingdom's 17th offshore licensing round is 21 March.

Green light for Galleon development

The £135-million second phase development of the Galleon gas field in the southern North Sea has been given the go-ahead by the UK Department of Trade and Industry. The project involves the installation of a new wellhead platform — Galleon PG — and the drilling of 11 development wells to drain the northwestern area of the field which straddles blocks 48/14, 48/15a, 48/19a and 48/20a. At least 770 billion cubic feet of gas is expected to be recovered.

Kvaerner Offshore Limited has secured the construction contract for the 800-tonne jacket and 650-tonne topsides. Work will be carried out at its fabrication yard at Methil in Fife.

Installation of Galleon PG is planned for the end of this year, while first gas from an initial three wells is due onstream in October 1998. Gas will be exported to shore via the Sole Pit Offshore Transportation System landing at the Shell/Esso reception terminal at Bacton on the Norfolk coast. The majority of gas is contracted to British Gas until 2010.

The project will employ multilateral horizontal well technology. 'This cost-saving technique improves each well's productivity by providing much greater penetration and area coverage in the reservoir, as well as reducing the number of wells required to develop the field,' explains Shell Expro.

World drilling record on Brent field

Shell Expro recently completed a record-breaking coiled tubing drilling (CTD) well on its Brent field in the East Shetland Basin.

According to Walter van de Vijver, Shell Expro's General Manager for the field, the 1,500 ft long well may be a world record for offshore operations. CTD has only been tried to a limited extent before in the North Sea.

'One of the attractions of the CTD system is that it does not require use of a main drilling rig,' Mr van de Vijver explained.

The system involves feeding slim-line tubing of two-inch diameter from a coil down into an existing well. The tip of the tubing has a powered drilling bit which can be controlled and steered via wiring inside the tube. Unlike conventional drilling operations, the tubing assembly does not rotate, only the bottom drilling section.

According to Shell, the cost of developing the well was around half of redrilling using conventional means which would have first involved removing existing pipe sections from the hole.

The company expects CTD to tap into an additional 10 to 20 million barrels in Brent over the next few years. Remaining recoverable field reserves are estimated at 400 million barrels.

Diary Dates

Energy Economics Group/British Institute of Energy Economics

'Middle East Megaprojects after the Millennium — the need to start now'

Tuesday 18 February, at 15.15

By Mr Pierre Shammas, Chairman, APS Group
At the Caledonian Club, 9 Halkin Street, London SW1

Contact: Mary Scanlan, 37 Woodville Gardens, Ealing, London W5 2LL
Fax: 0181 566 7674

London Branch

'Transport for the Millennium'

Tuesday 18 February at 17.30 for 18.00

By Mr Stephen Joseph, Transport 2000, and **Mr Richard Turner,** Freight Transport Association

One of the challenges of the 21st century is how to reconcile the benefits offered by private and commercial road transport and the attendant problems posed by traffic congestion and atmospheric pollution. The two speakers will discuss the issues from different perspectives and provide a fitting debate on a subject that affects all our lives.

The meeting will be followed by light refreshments, kindly sposored by Dewco Oil Services Ltd.

Contact: Mrs E Walker, Tel: 01926 404768

Energy Economics Group

'Taking forward the opportunities of energy liberalisation in the United Kingdom and beyond'

Tuesday 18 March, 17.00 for 17.30 until 19.00

By The Rt Hon the Lord Fraser of Carmyllie, UK Minister for Energy

IP contact: Jenny Sandrock

London Branch

'Back to Basics — Bitumen'

Tuesday 25 March, at 17.15 for 18.00

By Mr Martin Heslop, Acland Investments, and **Mr Paul Morgan,** Shell Bitumen

Bitumen has quietly been undergoing major changes in the last decade. Blending polymers and additives into the bitumen gives a range of 'designer' bitumens with enhanced performance to match each application. With the transition in specifications from recipe to end performance, manufacturers and contractors are forming closer links with binder suppliers in order to control consistency and to understand those properties which influence performance. Paul Morgan will explain the manufacturing processes and industrial applications, while Martin Heslop will describe road applications with this transition in mind.
Light refreshments kindly sponsored by Shell UK Ltd, will be available afterwards.

Contact: Mrs E Walker, Tel: 01926 404768

All meetings are held at the Institute of Petroleum unless otherwise stated.
Please tell the IP contact if you plan to attend any of these free meetings
Tel: 0171 467 7100 Fax: 0171 255 1472

Newsdesk

Landmark gas deal for British Petroleum

British Petroleum has signed a 15-year agreement to supply 15 billion cubic metres of gas valued in excess of $1 billion to Ruhrgas in Germany from 1 October 1998.

The gas will be supplied from BP's North Sea portfolio of fields and delivered to the continent via the Interconnector pipeline currently under construction from Bacton in Norfolk to Zeebrugge in Belgium. Onward transmission to the German border will be undertaken by Distrigaz in Belgium.

'This is a landmark gas supply deal for BP as it represents our first sale into continental Europe from the United Kingdom and our first use of the capacity we own in the Interconnector pipeline,' said Rodney Chase, Chief Executive, BP Exploration.

BP has also announced that since the restructuring of its gas marketing activities in the Unit last year, its share of the UK commercial and industrial gas market has more than doubled to reach 15 percent. The company is now second to British Gas in gas marketed in the United Kingdom.

Energy Africa signs deal in Gabon

Energy Africa has signed a major oil exploration and development partnership agreement with the Republic of Gabon under which Energy Africa Gabon (EAG) will acquire the right to participate in six potential development projects and 22 exploration projects in the country.

The acreage covered by the deal includes almost all the exploration licences currently in effect in Gabon and in excess of 80 percent of the onshore and offshore sedimentary basin of Gabon.

Under the terms of the deal, EAG acquires a 40 percent interest in the Niungo, Moukouti and Ganga satellites to the onshore Rabi Kounga field and 20 percent stakes in both the Ablette and Limande offshore discoveries as well as a 27.5 percent interest in the Turnix offshore discovery.

EAG is 25 percent owned by the Republic of Gabon and 75 percent by a joint venture company, the latter being held 50 percent by Energy Africa and 50 percent by an African investment group.

Brent Spar disposal – the choice continues to narrow

Shell UK Exploration and Production, on behalf of its parent group and partner Esso, has announced the short list for the decommissioning and disposal of the Brent Spar storage and loading buoy, still moored temporarily in a Norwegian fjord.

According to Heinz Rothermund, Managing Director, Shell Expro, the focus of Shell's efforts is to find a solution that is as good as deepsea disposal, the initial chosen option which was put aside in 1995 following a public outcry.

The option that emerges now will be compared with deepsea disposal which remains the 'benchmark' and to date the only option approved by the UK government. Whether it might still remain an option is continually glossed over.

Contractors	Raising from water	After raising from water
Brown & Root Energy Services	Raise and rotate with compressed gas	Scrap onshore
Kvaerner Stolt Seaway Alliance	Raise and rotate with compressed gas Raise vertically with compressed gas	Scrap onshore Topsides as training centre Hull as dock gate Hull sections as fish farm Hull as quay extension
McAlpine Doris	Raise and rotate with compressed gas	Hull as quay extension
Thyssen Stahlunion–Aker	Raise vertically with jacked cable lift	Scrap onshore
Wood–GMC	Raise vertically with jacked cable lift	Topsides as training centre Hull as quay extension
AMEC Process & Energy	—	Hull sections as coastal protection

Short list contractor groups and their proposals

Shell has now chosen 11 separate schemes put forward by six contractors/consortia from the 30 outline proposals submitted last year. Those on the short list are now being asked to prepare detailed proposals for re-using the redundant 14,500-tonne structure or scrapping it onshore and to submit commercial bids for carrying out their proposals.

The bids, which have to be ready by the end of April, will then be judged by independent assessors. It is hoped to submit the final choice to the government by the end of this year, so that decommissioning can begin early next year.

The short-list options have been selected according to various Best Practical Environmental Option (BPEO) criteria – lowest safety, environmental and technical risks. In particular, Shell looked for the lowest risk for personnel involved in the disposal work. At this stage costings were neither provided nor considered.

In selecting 11 proposals to go forward, Shell took into account views and comments made during the earlier dialogue process, when representatives from a very wide range of organisations were invited for a day's very open debate on the whole issue.

The proposals which are now going forward are in two parts – methods for raising the Spar from the water and for dealing with it afterwards.

The final choice might involve a combination of proposals from different contractors. AMEC's proposal, for instance, did not include suggestions for raising the structure from the water.

Eric Faulds, Decommissioning Manager, Shell Expro, said, 'The proposals now to be developed represent the best of those we were offered, while also maintaining a good range of potential solutions. In particular, the re-use ideas chosen for further work are those where a real potential customer has been identified.' He was referring to actual proposals for quay extensions in Teesside and near Stavanger and for coastal protection projects in East Anglia which are going ahead whether or not horizontal sections of the Brent Spar structure are used.

Oil market outlook

With most oil companies reducing their manpower in the area of monitoring short-term global oil market developments, the Oil Market Report *published by the International Energy Agency (IEA) is increasingly seen as the reference document for use both by industry and governments. At the IEA we are lucky that oil companies, consultants and governments are willing to share their information with us, while OECD countries submit a monthly supply/demand oil balance by product grade. However, from non-OECD countries information is not yet so detailed or timely.*

By Philip Starling,
Head, Oil Industry and Markets Division, International Energy Agency

During my time at the IEA I have aimed to establish the Agency as the clearing-house for information on the global oil market. I believe that we have gone a long way towards achieving this. However, I must point out that there is still scope for error and the unexpected and that I have prepared this paper on the strict understanding that my suggestions about the current year are not held against me in 12 months' time.

Prospects for 1997

Prospects for demand in 1997 can best be understood by looking at the annual changes which have occurred over the 1990s. Growth in OECD demand, shown in **Figure 1**, was curtailed by recessions in 1990 and 1991 in the anglophone countries and then in 1993 in other OECD countries, with low growth in Japan continuing until last year. Colder weather in the first quarters of 1994 and 1996 than in the corresponding quarters of 1993 and 1995 contributed to stronger growth in both 1994 and 1996. Total OECD economic growth is expected to be about the same this year as in 1996 and the slight slowdown of growth is the result of an assumed return to normal weather after the colder-than-normal weather in the first quarter of last year.

It will be noted that oil demand is growing much more strongly in developing countries than in OECD in volumetric terms (see **Figure 1**). Since developing country demand represents only about 60 percent of OECD demand, the difference is even greater in percentage terms. Over the 1990-96 period the average annual oil demand growth rate of the OECD was 0.6 percent, compared with 5.2 percent for developing countries. Growth was muted in 1990 and 1991, partly due to the sharp decrease in demand in Eastern Europe but since then annual demand growth has been remarkably constant at around 1.2 million barrels per day (b/d) and similar growth is expected this year. African demand has been growing only moderately and Latin American demand has been growing only slightly more strongly, reflecting a variety of economic problems.

The real strength has been Asia. We expect that Asian demand, including China, will be 5.1 million b/d higher this year than in 1990, a 65 percent increase over the seven years, equivalent to two-thirds of the total growth in developing countries. This strong Asian growth is the result of a combination of high economic growth in many countries and rapidly expanding population. Oil use per capita is, of course, still far below OECD levels and the scope for further growth is considerable.

Table 1 shows the top 20 countries in the world ranked in terms of their total oil demand growth over the 1989-96 period. It will be seen that the two countries with the largest growth and six of the top 10 are in Asia. Although the United States and Japan are third and fourth, that fact reflects the magnitude of base demand, while the growth rates are negligible compared with the average of 14 percent per year experienced in South Korea. To put South Korea in perspective, the growth over the seven-year period is equivalent to over 70 percent of the total UK demand in 1995!

Returning to **Figure 1**, the dramatic

Table 1

Total Demand Growth: 1989-96

		kb/d	% per annum
1	South Korea	1,300	14.1
2	China	1,220	6.1
3	USA	1,190	1.0
4	Japan	720	1.9
5	India	560	5.8
6	Iran	460	5.9
7	Brazil	390	3.5
8	Thailand	370	10.8
9	Indonesia	320	6.5
10	Malaysia	240	10.7
11	Mexico	230	1.9
12	Singapore	220	6.9
13	Germany	220	1.1
14	Taiwan	220	4.9
15	Spain	190	2.6
16	Saudi Arabia	190	2.8
17	Canada	180	1.4
18	Turkey	160	4.4
19	France	140	1.0
20	Pakistan	140	7.7

Figure 1

effect of the decline in FSU demand on global oil demand growth is clear. FSU demand last year was expected to be half the peak demand reached in 1987, a reduction of 4.5 million b/d in nine years. The reductions in FSU demand in 1992 and 1993 were the overriding reasons for the low global oil demand growth in both years while, excluding the FSU, the strongest global demand growth was in 1994. That we are anticipating slightly higher demand growth than this year than can be seen to be primarily due to our assumption that the decline in FSU demand will come to an end. Forecasting FSU demand is a thankless task. A year ago economists were expecting the economy to recover in 1996. The latest advice is that it will decline by over 3 percent and grow marginally this year. In addition to uncertainty about economic growth, there are uncertainties about domestic pricing and the rate of substitution and efficiency improvements.

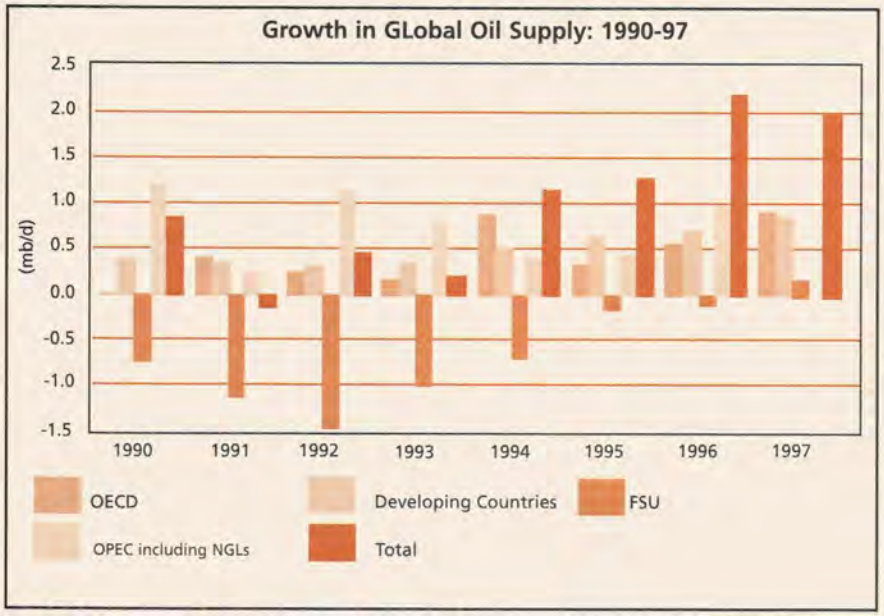
Aggregating the different projections in the three areas I have been discussing, we forecast that global demand growth will increase from 1.7 million b/d last year to 1.9 million b/d in 1997 – equivalent to 2.7 percent.

Growth in supply

I would now like to turn to how that demand is likely to be supplied. **Figure 2** shows growth in oil supply over the 1990-97 period. OECD production growth has accelerated since 1993, primarily due to the strong growth of North Sea production. The latter was expected to increase by 0.5 million b/d or 8 percent last year and 0.8 million b/d or 13 percent this year. The other significant factor is that North American production, which fell by 1.5 million b/d between 1985 and 1994, is now remaining roughly stable, with offshore production growth, particularly in the US Gulf of Mexico, offsetting the decline in the mature onshore fields.

Oil production in the developing countries has increased strongly, growing by over 2.8 million b/d or nearly a

Figure 2



quarter over the 1990 to 1996 period. In volume terms, the largest contributions to this growth have been in Latin America and Asia but there has been continuing growth in all regions except for Central and Eastern Europe. FSU production has fallen even more rapidly than demand, decreasing by 5.2 million b/d or over 40 percent between 1989 and 1996.

The remainder of the global supply has come from OPEC. The chart includes OPEC NGLs, which are excluded from the quota and which have increased by 0.6 million b/d or a third since 1990. Production growth has slowed since the current quotas were frozen over three years ago but not by very much. Indeed, excluding Saudi Arabia, Kuwait and the United Arab Enirates which have been adhering to their quotas, production from the remainder of OPEC has been growing more rapidly than non-OPEC in percentage terms since the quotas were frozen, with Venezuela making the largest contribution.

Supply/demand balance

Having reviewed demand and supply trends, I would like to consider prospects for the global supply/demand balance in 1997. We do not forecast OPEC production but rather the call on OPEC crude plus global stock change which is simply global demand minus non-OPEC supply and OPEC NGLs. With global demand expected to grow by 1.9 million b/d or 2.7 percent and non-OPEC supply plus OPEC NGLs projected to increase slightly more quickly, our 'call' is seen to be 0.3 million b/d lower than last year. A crucial issue in this scenario is, of course, the extent to which oil companies may wish to raise stocks towards what used to be called 'normal levels'. My personal belief, based on talking to several oil companies, is that as long as the market remains in backwardation, companies will not move away from their new policy of low stocks.

If then we make the assumption in the base case that global stocks would only increase by, say, 0.3 million b/d to service growing demand, the requirement for OPEC crude oil would be 25.5 million b/d, 0.6 million b/d lower than the November production level. In this environment, if the majority of OPEC countries continue to increase production as they did last year, and Iraqi exports are maintained at 0.6 million b/d or more, there is clearly the potential for appreciable oversupply and hence weaker markets. Such an oversupply, were it to occur, could result in short-term prices falling below forward prices – the market would move into contango and oil companies should then be willing to hold additional oil since they would be able to lock in a profit by selling forward.

All this sounds very like what we were anticipating 12 months ago and we clearly could be equally wrong this time. As I said in my introduction, the scope for errors is enormous. The main factors that could lead to a tighter market than we are forecasting are slower growth in non-OPEC supply, perhaps due to unforeseen supply disruptions for either political or physical reasons, colder that normal winter weather leading to higher demand or a continuation of the upward adjustments we have seen to non-OECD demand because much of the actual data comes in late.

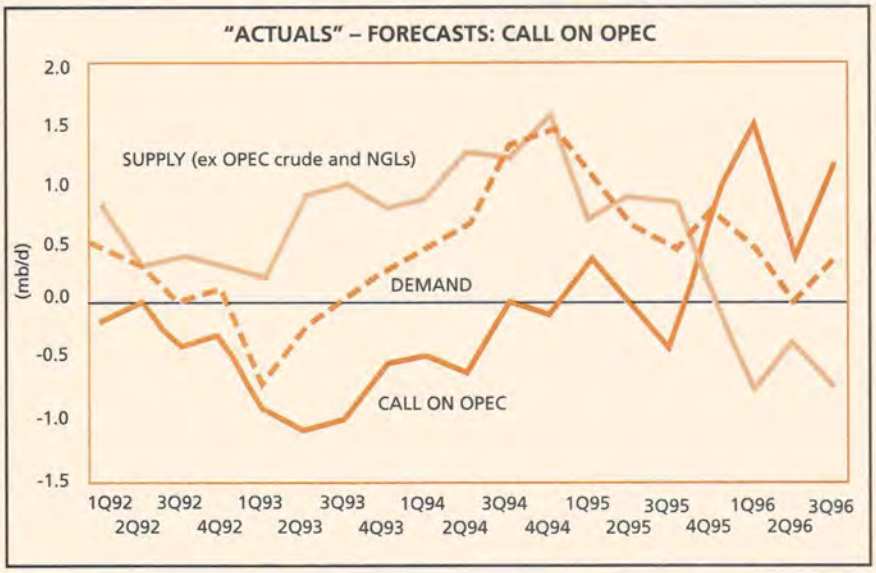
Trials of forecasting

We have been criticised for underforecasting the call consistently during the past year but it is important to realise that this follows a period when we consistently overforecast it. **Figure 3** shows the differences between the projections we made six months before each quarter began during the past five years and what we now assume global oil demand, supply and the call on OPEC plus stock change to be.

I use the word 'assume' advisedly because we know that even our historical balances are in error. Whether we have been overestimating demand or underestimating supply or some combination of the two, we simply do not know.

We have on average underforecast demand, although we had a particularly good spell during 1992-93 but this was largely due to FSU demand falling more quickly than anticipated. Our performance on OECD demand in percentage terms is better than on non-OECD because we have more up-to-date and comprehensive data. The comparisons suggest that we have

Figure 3



made some improvement in our forecasting recently but, of course, we will have to wait until 1998 to get final numbers for last year. We assume normal weather and therefore if we were to have forecast demand correctly in a colder-than-usual winter, it would have been a bad forecast!

Turning to the supply side, we consistently underforecast non-OPEC supply up to a year ago, with the magnitude of the difference being first reduced and then increased by errors in predicting the rate of the decline in FSU production. Last year, primarily due to a combination of abnormally bad weather in the first quarter, we began to overforecast for the first time. It is now possible that we have an inherent bias to overforecast in that we make no allowance for unforeseen political events, strikes etc that reduce oil supply. While it might be possible to include some clearly defined bottom-line adjustment for this, based on an average of past experience, the new methodology has been in use for such a short time that we neither have a credible foundation for doing so nor are we yet sure that all sources of underforecasting have been eliminated.

Figure 3 shows that for the period up to 3Q95 we had consistently underforecast the 'call' by an average of 0.4 million b/d. We were fortunate in that, as we were underforecasting both supply and demand, the errors tended to cancel out and we had some periods where, quite by chance, our projections of the call were extremely accurate. All this changed dramatically last winter. As already discussed, the colder-than-normal weather increased OECD demand in 1Q95 and uniquely bad weather in many areas of the world reduced supply. Unlike during the period of underestimating both demand and supply, the effect of the weather on the call was additive, increasing demand and reducing supply, and hence leading to the largest difference during the four years in the first quarter of last year. Looking to the future, we clearly see a need to do further work to improve accuracy, particularly in the non-OECD demand side and in monitoring the reliability of our approach on non-OPEC supply.

Emphasis on offshore

The major revolution on non-OPEC supply is offshore. As our new book *Global Offshore Oil Prospects to 2000* describes, during the 1990 to 1995 period, non-OPEC offshore production grew by 3.2 million b/d, while onshore production fell by 2.7 million b/d, because of the substantial decline in FSU supply. Over the 1995 to 2000 period, offshore production is expected to grow by 5.2 million b/d, representing over 80 percent of non-OPEC production growth. In the first half of this decade, two-thirds of the growth was in the North Sea. In the second half of the decade the growth in the North Sea is expected to slow somewhat. However, offshore production in North America, particularly, in the Gulf of Mexico, is expected to accelerate and almost match the North Sea growth.

There are three main reasons for this growth in offshore production. First, changes in government policy and tax structures have made offshore developments more attractive, particularly in the North Sea, but most non-OECD countries also recognise that upstream development is a buyer's market and that the terms and conditions they offer must be competitive. Secondly, new organisational approaches to facilities management and expanded risk/reward partnerships have been developed. Increased standardization of equipment and cooperative efforts among oil and service companies and between companies and governments have created a commonality of purpose. Thirdly, and most importantly, there have been great advances in the application of new technologies.

Advances in technology

New seismic techniques and information-processing methods have provided much more useful information. The most important innovation that has enabled extensive satellite field development is directional drilling which has allowed companies to reach deposits from platforms that are several kilometres away.

In addition, directional drilling is used at the production stage to enable several satellite fields to be developed from the same fixed platform. Fixed

platforms are very expensive, have long lead times and require careful planning for decommissioning. Increasingly, therefore, floating production storage and offloading vessels are used which can be employed on one field and then quickly be moved to begin production from another. These and other new technologies have dramatically reduced the cost of production and hence the minimum economic reserve size. For example, in the North Sea, this minimum has been reduced from 100 million barrels to as little as 10 million barrels. With so much of the development being carried out by international companies, new ideas and new technologies developed in one offshore area are rapidly being transferred to others, thus adding to the global growth in offshore production.

Future scenarios

If the growth in non-OPEC offshore production is as high as suggested in this book, the implications for global oil markets would be significant. Allowing for the anticipated much smaller growth in non-OPEC onshore supply and assuming the growth in global oil production shown in last year's IEA *World Energy Outlook*, there would be little or no scope for additional OPEC production by 2000. In this scenario it is currently unclear how the fuller return of Iraqi exports would be accommodated, let alone the aspirations of other OPEC members to higher production and hence revenues.

It should be recognised that there is scope for actual production in 2000 to be appreciably lower or higher than suggested in this study. The timing of the start-up of new fields and the speed with which their production builds up, together with the rate of decline of older fields are crucial to the forecast. Key factors which could lead to lower production in 2000 are political developments, a deterioration of project economics due to changes in fiscal regimes and higher drilling costs perhaps due to a shortage of drilling rigs, or sharply lower oil prices. In some cases, where the additional oil is linked to the production of additional natural gas, lower than anticipated demand for gas could also slow oil production growth.

Refining prospects

At first sight, European refining margins are something of an enigma, as oil demand is growing and refinery utilisation rates are the highest for many years and yet marginal refining margins have been at their lowest level since 1988.

The main problems in the refining industry are the inevitably long lead times and the enormous difference between total and marginal costs. High margins at the time of the Gulf crisis and more stringent gasoline specifications in the United States led to a surge in new conversion capacity and additions to global capacity in the 1993-95 period were the highest since 1987. Unfortunately for refiners, this occurred at a time of a lightening in the global crude slate, for example, due to the surge in North Sea crude production and the Saudis' decision to increase revenues while maintaining quotas by increasing the share of lighter, higher value crudes. In Europe, demand for gasoline grew more slowly than expected, in part due to the increasing use of diesel cars. All this contributed to a surplus of conversion capacity and particularly gasoline production capacity. Once the investment in capacity has been made, low marginal operating costs encourage refiners to run new plants up to the break-even point to earn marginal profits, regardless of the consequences for oil product prices. The substantial difference between total and marginal costs means that, except at rare times of capacity shortage, refining margins are never at a high enough level to obtain an adequate return on investment.

Trying to predict whether refinery capacity will be tighter this year to a sufficient degree to improve average refining margins significantly is extremely difficult. The conversion capacity balance depends upon the growth of light product demand relative to fuel oil, changes in the heaviness of the global crude slate and the amount of new capacity coming into operation. One factor that could depress margins this year is the likelihood of lower distillate exports from Europe to the Far East following the surge in new refining capacity in the latter region. Conversely, the global demand barrel is expected to continue to get lighter slowly and there is the hope of increased gasoline exports to the United States, particularly if the US seasonal stock-build is inadequate. There is relatively little new refining capacity coming onstream in the Atlantic Basin and closures have been announced in Milford Haven and Denmark. On the crude slate side, 95 percent of the net growth in North Sea crude production last year was heavy (below 29° API) and over a third is expected to be heavy this year. In addition, increasing volumes of West African crude are likely to move to Asia to meet their low sulfur crude needs. Finally, it should be noted that, in a rising market such as we saw last year, product prices tended to lag crude prices, depressing average refining margins. Conversely, if prices do fall this year, this would improve average margins. In summary, there seems currently to be more factors which could lead to higher margins than lower margins but please don't treat this qualitative approach as a forecast!

Acknowledgement

This paper is based on an address given by Philip Starling to the British Institute of Energy Economics in London last November.

Towards 2020: a study to assess the potential oil and gas production from the UK offshore

The aim of this study, which looks forward 25 years, is to analyse the potential for oil and gas production in relation to levels of exploration effort, the rate of development of new discoveries and the implied required financial commitment.

By Dr B G S Taylor OBE,
Director – Technical Affairs,
UK Offshore Operators Association

This is a difficult task because the full extent of the hydrocarbon resource is unknown and the future economic climate is uncertain. It is important to look ahead, however, to provide a basis for planning financial, physical and human resources and to underpin discussions with government and other stakeholders.

If production from Annex B developments is projected ahead, as for example in **Figure 1**, the outlook appears grim with oil and gas production declining rapidly. What is missing is the potential contribution from new oil and gas fields already discovered and yet to be discovered. The extent to which new developments can mitigate this natural decline of production from existing oil and gas fields was the main objective of the *Study 2020*, published last year by UKOOA.

Objectives and scope

The objective was to evaluate potential opportunities for exploration, development and production over the next 25 years. The scope of the study encompassed a detailed assessment of all existing discoveries, the likely results of future exploration activity, the size of fields that may be developed and the pace of new field developments.

Assessment of existing discoveries

The starting-point for the study was a detailed questionnaire completed by all UKOOA members. This provided information on each and every discovery including discovery date, location, technically recoverable reserves and, for discoveries not yet in production, the likely development method, ie fixed, floating or subsea production system.

Oil Discoveries

A total of 187 oil discoveries were identified, around half of which are in production. These 96 fields with an average size of 219 million barrels (mnb) account for 85 percent of the total oil reserves so far discovered. The average size of the 91 discoveries not yet committed for development is 41mnb, only one-fifth of the size of producing fields. In other words the industry must bring five new discoveries into production to replace an existing field of average size.

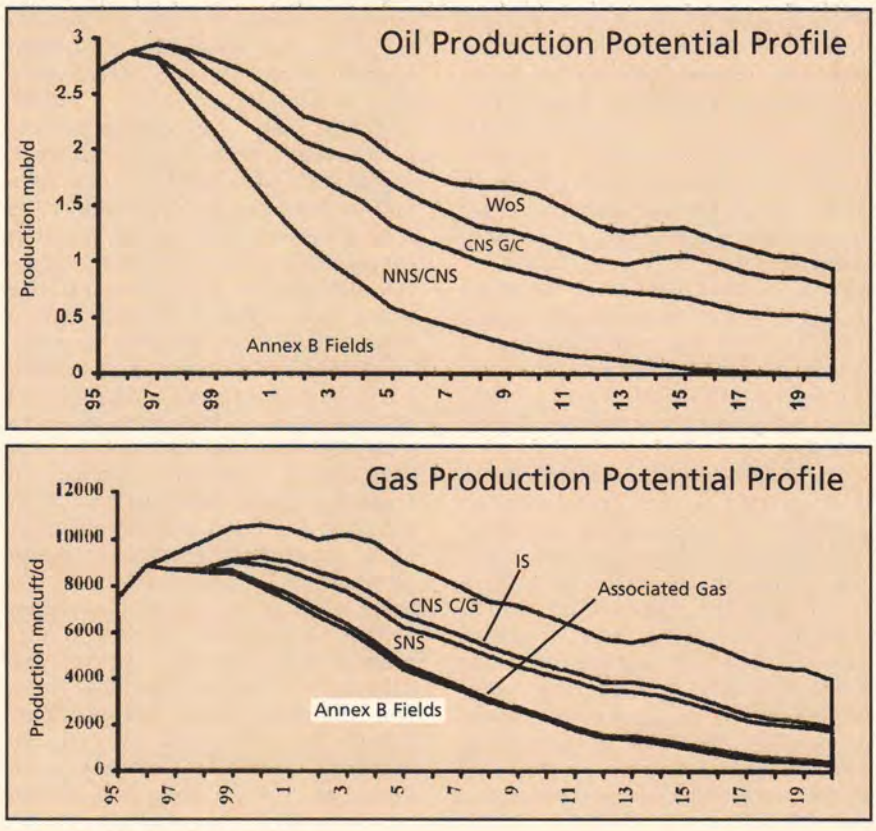


Figure 1a (top) and Figure 1b

Gas discoveries

A similar picture emerges for gas discoveries. A total of 133 gas discoveries were identified, around half of which were in production. These 64 fields, with an average size of 860 billion cubic feet (bncuft), accounted for 85 percent of the total gas reserves found so far. The average size of the remaining 69 discoveries is 140 bncuft, only one-sixth of the size of producing fields. Therefore six new fields are required to replace one average existing field.

Gas-condensate discoveries

Gas-condensate reservoirs are different in that the reservoir fluid contains substantial quantities of gas. They are usually more complex geologically and pose technical challenges in production which may involve gas reinjection and commercial difficulty in disposing of oil and gas products. These factors have contributed to the slower pace of development of these fields.

A total of 41 gas-condensate discoveries were identified, containing 2.8 billion barrels (bnb) oil and 18.4 trillion cubic feet (tncuft) gas. Less than one-third of these are in production, accounting for less than half of the total reserves. The average size of discoveries yet to be developed is close to half the size of fields already in production. This contrasts with the situation for oil or gas fields and illustrates that there is substantial potential for future oil and gas production from this type of discovery.

Size distribution of discoveries

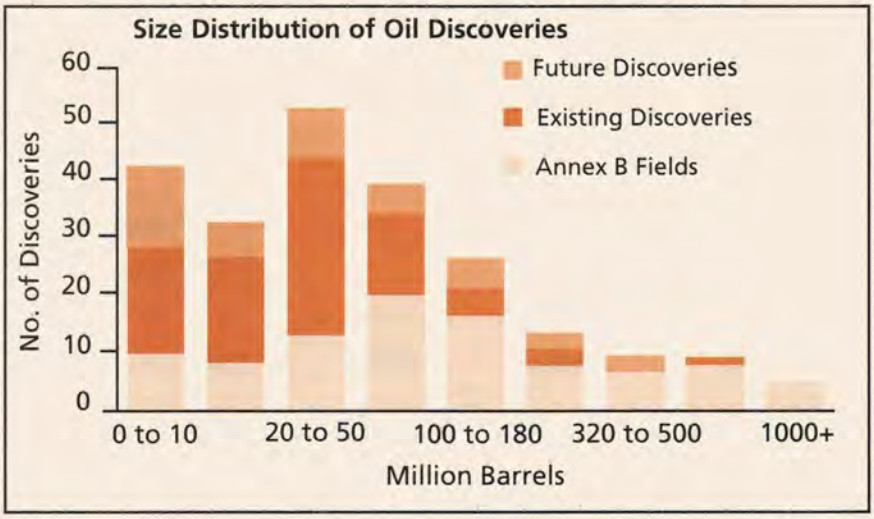
The information provided by the questionnaire was very detailed and can be used and displayed in many ways. For example, **Figure 2** shows the size distribution of the 187 oil discoveries. Those fields in production or under development (ie with Annex B approval) at the end of 1994 are shown separately from other existing discoveries. It is immediately apparent that the majority of discoveries contain less than 100 million barrels oil and that most of the larger discoveries are already in production.

In **Figure 3** the same discoveries are displayed by size of reserve rather than number. Although the larger fields are small in number, they contain most of the reserves. The large number of smaller discoveries yet to be produced contain a small fraction of the reserves of the currently producing fields, the careful stewardship of which will play an important role in future production levels.

This detailed knowledge of previous discoveries was used in the study to examine the likely results of exploration activity. The future discoveries shown in **Figures 2 and 3** are discussed later in this paper.

Estimating future potential

To analyse the likely results from future exploration activity, UKOOA used a statistical method that relates future exploration results to exploration history. In other words, the experience of the past is extrapolated into the future. This method is valid only for mature exploration provinces which have reached a stage where the rate of exploration success is falling and the size of discoveries is declining. To determine whether this is the case for the UK offshore, every exploration well is plotted in chronological order against both the number of discoveries made (which gives a measure of success rate) and the size of discovery.



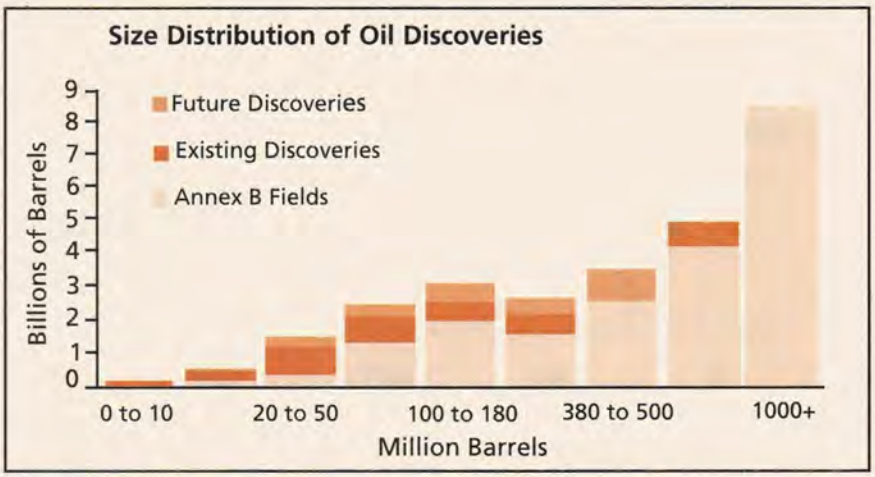


Figure 2 (top) & Figure 3

Central North Sea

Results for the Central North Sea (CNS) are shown in **Figures 4 and 5**. In total 1,015 exploration wells have been drilled in the CNS, yielding 168 discoveries of which 126 were classified as oil. On the x-axis each exploration well is plotted in chronological order. On average one well in eight discovered oil but it is evident from **Figure 4** that the rate of success is gradually falling. There is a very close fit between the actual exploration results and the statistically fitted curve.

The decline in discovery size is evident from **Figure 5** which shows on a log scale the size of the 126 discoveries, again in chronological order. In this case there is considerable scatter in the discovery size at any given point on the curve; this variation can be represented by a normal distribution around the mean size.

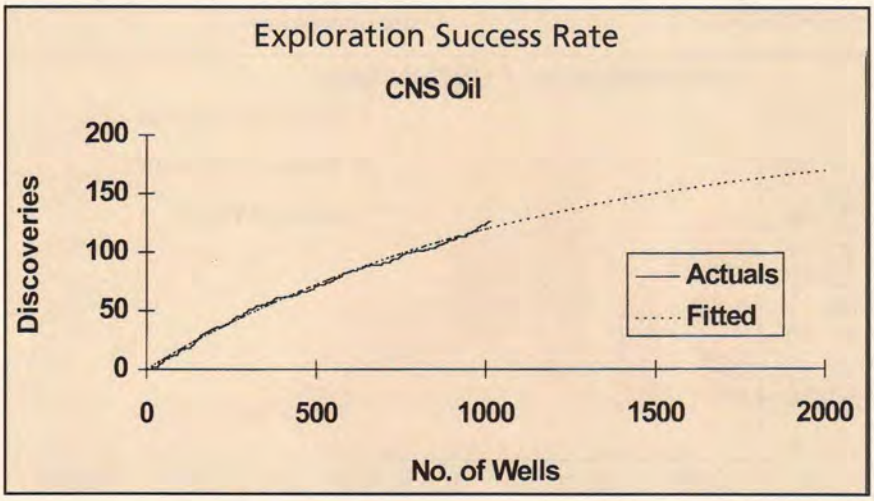
It has been verified that the requirements for this mathematical technique are satisfied for gas discoveries in the Southern North Sea (SNS) and oil discoveries in the CNS and Northern North Sea (NNS).

The exploration model

The probability of success and the field-size distribution for a find at any future level of exploration is simulated using a Monte Carlo sampling technique at each well to decide if successful or not and, if successful, where the discovery falls within the field-size distribution. By carrying out a sufficiently large number of simulations a probability distribution of outcomes of the exploration programme may be assembled.

The model progresses through each well in sequence, computing the probability of success, 'p'. A random number 'n' is then drawn and compared with the probability of success, 'p'. If 'n' is less than or equal to 'p', then the well is taken to be successful. (The random number always lies between 0 and 1, so that if a long run of samples is taken it can be seen that a fraction 'p' successes would occur.)

When a discovery is made the field size corresponding to the (logarithmic) mean of the field-size distribution is determined, thus defining the distribution. A second random number is drawn and related to the cumulative probability under the log-normal distribution. Thus a draw of 0.5 would yield a find of the size of the mean; similarly, less than 0.5 would produce a field smaller than the mean, and greater than 0.5 bigger. A schedule of discoveries by well number is thus built up.



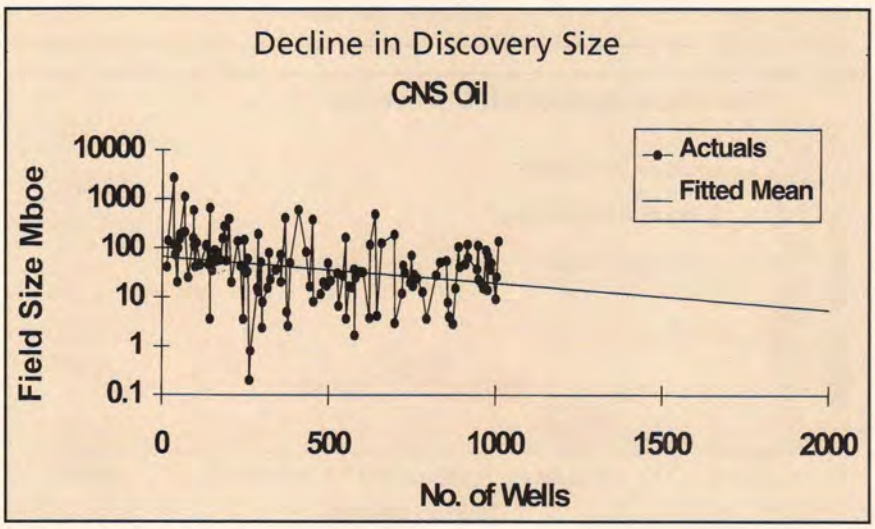


Figure 4 (top) & Figure 5

Gas-condensate discoveries

Exploration results for gas-condensate do not satisfy the rigorous requirements for statistical analysis. The absence of a statistically significant decline in the size of these discoveries indicates that these accumulations are at an early stage in their discovery history. The evidence suggests that gas-condensate discoveries have tended to emerge only as a by-product of the search for oil.

In view of the fact that the exploration results for gas-condensate discoveries do not meet the strict criteria for the analysis, the future outlook for these discoveries was obtained by carrying out two separate analyses, one based on oil and gas-condensate data and a second based on oil discoveries alone. The outlook for gas-condensate discoveries was obtained by differencing the results.

West of Shetlands

The eight discoveries reported include six oil and two gas but the historical build-up of reserves and discoveries shows no evidence of a fall-off in success rate, nor is there any evidence of a decline in discovery size.

In view of the relatively small number of exploration wells drilled in the West of Shetlands area and the random nature of results so far, it was assumed that further exploration, equivalent to experience thus far, would yield eight more discoveries containing equivalent hydrocarbon reserves to those discovered to date.

Representative fields for the industry activity model

Fields with Annex B approval, existing discoveries not yet in production and future discoveries predicted by the Monte Carlo analysis are grouped in a series of representative field sizes as shown in **Figure 2**. Each field within a size range is considered to possess the same properties in terms of reserves, cost and production profile as the representative field. This facilitates the analysis of the data in the Industry Activity Model.

The industry activity model takes as input an inventory of existing fields, a sequence of future finds (from the exploration model) and a set of 'typical' field data. The latter comprises field size, production profile, capex, opex, platforms installed, wells drilled and kilometres of pipeline laid.

The analysis uses a sophisticated model which allows discoveries of all sizes to be developed within the same time-frame. It also allows for different development options such as subsea or floating production systems to be used and is a powerful tool for investigating a wide range of future development scenarios.

The study highlighted some interesting insights into the future of the offshore business:

1. In the past six years, 5.7 bnb of new oil reserves have been added to the UK inventory. In analysing the increase in reported reserves since the previous study in 1989, it was evident that improved expectations from producing fields accounts for two-thirds of oil reserve additions. There are a number of reasons for this – use of 3D seismic, long-reach directional drilling, reduced operating costs extending life of field. It is also consistent with less onerous tax treatment of incremental investment post-1993.

This is an important observation because it means that careful management of existing producing fields can and will make a significant contribution to future production.

2. The study confirmed that the majority of future developments will be much smaller than those in the past. Many of these, probably the majority, will be produced with subsea or floating production technology. There will be very few large fixed platforms, although there will be some, especially for the larger gas-condensate discoveries, which will require substantial facilities offshore.
3. Total expenditure on exploration, capital investment and operating expenses is expected to remain in the range £8-10 billion for the next 10 years.

Oil production potential

Figure 1a illustrates UKOOA's most likely scenario for future oil production potential.

Oil production is expected to continue rising strongly to 1997-98, levelling at around 3 million barrels/day.

The natural decline in production from the present Annex B fields will be mitigated by new production from oil discoveries in NNS/CNS, gas-condensate discoveries in CNS and oil from West of Shetlands.

There are a number of reasons why this is probably a conservative outlook:

1. Production from Annex B fields may well be increased by improved reservoir management not yet included in operators' returns to the UKOOA questionnaire.
2. Production from West of Shetlands could be higher than this rather modest outlook.
3. There may be new production from frontier areas such as Rockall, the English Channel and the Western Approaches. None of this speculative potential is included in the study.

Gas production potential

The outlook for gas production is equally encouraging, as shown in **Figure 1b**. Gas production is on a steeply rising trend which is expected to continue through the end of the century, thereafter falling slowly. Again the gradual decline in production from the existing Annex B fields will be offset by new production from SNS, CNS gas-condensate and the Irish Sea.

As with the oil outlook, there are reasons to believe this is a conservative outlook. Unlike oil, the demand for gas is not assured and for this production potential to be realised, demand for gas will need to increase – either by greater use for power generation or by exports through the Interconnector to Europe.

Potential constraints

This outlook for the next 25 years is buoyant but there are a number of potential constraints which need to be noted which could pose some threat:

1. Although the study does not consider oil and gas prices specifically, substantially lower prices would reduce the production potential.
2. Any adverse changes to the fiscal system in the United Kingdom could inhibit exploration and production. Stability of the fiscal regime is assumed.
3. Any artificial restrictions on the use of gas, for example, for power generation or export, would reduce gas production.
4. The imposition of the Working Time Directive on the offshore industry would increase costs and jeopardise safety, neither of which would help the outlook.
5. Finally, the exclusion of prospective acreage from future licensing rounds for environmental or other reasons would reduce the potential for future discoveries.

A learning society – a new direction for the IP

In many business sectors there is an increasing awareness that future competitive success will only be achieved by those companies which are able both to create a culture where their employees are continuously learning and where that knowledge can be transferred from individuals to the company as a whole. This implies investment in both people and systems. For the individual there is a recognition that his or her knowledge, skills, experience and relationships are the source of future organisational success.

By Anthony Levy,
Principal Partner, Ideas Into Action, and a member of the IP Council

This has all arisen whilst the employment structure of many industries has become more fragmented with the reduction in numbers of people employed in major companies and a proliferation of small- and medium-sized enterprises providing services on a contractual basis. As a consequence, many of the traditional personal development and training systems have undergone either dramatic change or they have simply disappeared. There are no longer any jobs for life or careers likely to be fulfilled in any one company. For individuals this is fundamental change from a concentration on 'employment' to a new world where 'employability' should be the primary concern.

Emphasis on employability

The oil and gas sector in many ways epitomises these changes. As the larger companies have reduced numbers of employed staff, many of the traditional career paths and development opportunities have disappeared. Increasingly every area of operation is involved in working with third-party organisations. This includes all aspects of professional and managerial work as well as what were once referred to as 'non-core activities'. For some this has been a difficult transition but for many, and particularly younger people in the industry, this new world is an exciting one where they see their careers developing in very different ways via a range of different organisations. For everyone, the renewed emphasis is on continuously improving skills and knowledge so that one's competitive value increases.

These factors have been at the heart of many company and profession based Continuous Professional Development programmes. It has also been the stimulus for the Institute of Petroleum (IP) to consider what role it should play in the future in helping its members to compete and succeed in such a turbulent world. After all, learning is the central theme of the IP Mission for the advancement of knowledge. Over the past year the IP Council has been devoting a lot of time to considering how the IP should develop in this field and last December it adopted an important Policy Statement, initiated 12 key projects and committed itself to putting resources behind an important shift in the direction to be pursued over the next few years.

Policy Statement

Learning is at the heart of the IP's core purpose. The IP is a learning society. It aims to stimulate and assist members to acquire all the knowledge, values, skills and understanding they require throughout their lifetimes and to apply them with confidence, creativity and enjoyment in the industry.

The essential principles of the IP approach to lifetime learning are:

- Learning is the responsibility of individual learners
- Learning should have as its aim improved performance
- Learning objectives should be clear and should address industry needs as well as professional organisational and personal needs
- Outcomes of learning are more important than the amount of input
- Learning opportunities come from work, access to information and contact with others, not just training.

The establishment of this Policy Statement gives the IP an underlying clarity about its future direction as a membership-driven, technically based organisation seeking to meet the changing needs of its very diverse membership. Central to this is Council's view that the IP is not in competition with

other professional institutes. Rather it seeks as an industry-based organisation to work with engineers, geologists, accountants, marketers, economists and other professional associations to ensure that each individual can be supported in Learning in three fields – company activities, professional activities and industry activities.

Of course, much of this is nothing new! The IP has for many years been involved in Learning through all its work, whether in technical areas or through the branch network, *Petroleum Review*, conferences, discussion groups, and the Library and Information Service. Maybe we have not always appreciated what we have! But the identification of the IP as a Learning Society gives it the opportunity to develop and build on its strengths and successes to meet the changing needs of its members. In particular the projects that have been identified for development over the next few years put a great deal of emphasis on creating more perceived value for younger members and changing the culture so that the IP is rightly perceived as representing men and women as well as upstream and downstream, technical and commercial, young and experienced. The projects also involve giving more direct support to branches, running regionally based conferences and workshops and investing in IT to permit remote access, so that more quality learning opportunities are delivered away from London.

Changing culture

The strategy is designed to have benefits to all our stakeholders. For the individual members it aims to establish an organisation which delivers services which help its members to enhance their knowledge and skills within the oil and gas industry, gives them new opportunities through enhanced capabilities, and ultimately their employability. Services may be directly delivered by the IP, arranged jointly with other quality organisations, or the IP might simply act as the central focus for information to direct members to opportunities where

their need could best be met elsewhere. For the IP, it is hoped that by raising the quality and range of services directed towards members, it will be able to continue to increase the size of the membership and to enjoy an increased proportion of active members volunteering their time. The IP itself represents a considerable Learning opportunity, whether working on a technical committee or taking part in a branch meeting. For the companies in the industry the IP will be helping to raise capabilities in the pool of talent available and will assist individuals and companies to develop their knowledge and skills in areas which have been identified as future requirements for the success of the industry throughout Europe.

Action plans

There is, of course, much to do. Having set the direction, Council has handed the 12 projects back to IP staff to turn the vision into a reality over the coming months and years. What is essential in an organisation that depends on individual voluntary commitment, supported by a small dedicated professional staff, is that members pick up this opportunity to contribute by volunteering their time to the various committees, branches and projects that will deliver the real benefits for members. If the IP is to succeed in building on its current strengths and in meeting the very diverse needs of its membership, it requires its members to recognise that they can learn more by playing an active role in the IP's development as well as their own.

The huge changes in the structure of the industry and in its patterns of employment demand that the individual takes more responsibility for his or her career. A commitment to lifetime learning is a critical factor in achieving success in this environment. The decision by the IP to become a 'Learning Society', and the implementation of its 12 key projects over the next few years, will provide valuable support to members as they strive for personal and organisational success.

The Institute of Petroleum

Chemical tracking of secondary oil migration

Secondary oil migration, in which petroleum moves by buoyant and hydrodynamic forces from the proximity of the mature source rock to reservoir, occurs on lateral scales of up to several hundred kilometres. The quest for reliable molecular indications of the absolute or relative distance migrated by reservoir oil away from its source rock — a chemical mileometer — has been a goal of petroleum geochemists for many decades as it would allow regional petroleum charging directions into complex structures to be studied.

By S Larter, B Bowler, M Chen, D Brincat, B Bennett, K Noke and P Donohoe (University of Newcastle), in collaboration with M Li (ISPG), D-J Simons and M Kohnen (Shell), J Allan (Imperial Oil Resources), N Telnaes (Norsk Hydro) and I Horstad (Saga Petroleum)

The Newcastle Research Group (NRG) of the University of Newcastle has been working towards this goal since 1990 when its first study of petroleum nitrogen compounds, together with Geolab Nor — funded by Phillips Petroleum — began. Aromatic nitrogen compounds such as alkylbenzoquinolines and alkylcarbazoles were first suggested as potential migration monitoring components of petroleum with suitable physicochemical characteristics to interact with carrier bed phases such as minerals and kerogen during primary and secondary migration.[1-3]

On the right track

More recently, NRG has compared non-alkylated benzocarbazole distributions in suites of related migrated petroleums from defined petroleum systems to show a systematic reduction in the concentrations of benzocarbazoles and in the ratio of abundance of benzo[a]carbazole to benzo[c]carbazole (BCP1) and benzocarbazole/(benzo[a]carbazole + benzo[c]carbazole) — the BC ratio — with increased secondary migration distance. (The results of this work were recently reported in *Nature*, Volume 383, 17 October 1996, pp 593-7.)

Removal of the more rod-shaped benzo[a]carbazole relative to the subspherical benzo[c]carbazole with increasing secondary migration appears related to the selective sorbtion on/in clay minerals and solid organic matter in the carrier bed. Maturity is not a significant factor affecting non-alkylated benzocarbazole distributions. The benzocarbazole abundance ratio benzo[a]carbazole/benzo[c]carbazole (the benzocarbazole-parameter BCP1) is proposed as a largely maturity independent assessment of the relative secondary migration range of related petroleums. If verified by field test data sets this could represent the first viable chemical mileometer.

Molecular geochemistry

As direct sampling of most petroleum systems is usually only possible through boreholes located on structurally high parts of basins, molecular indications of source rock and carrier system properties derived from analysis of reservoired petroleums are of inestimable value.

Molecular indicators of petroleum source organic matter type and source rock maturity — such as biomarker or aromatic hydrocarbons — have been widely applied to defining the source characteristics of petroleum systems from analysis of reservoired fluid samples and have had a revolutionary impact on petroleum geochemistry in the last two decades.

Though some success in defining regional petroleum migration path-

ways in well explored basins from application of biomarker hydrocarbon geochemistry has been achieved, successful application of molecular geochemistry of a reservoired petroleum to the definition of migration range (source-reservoir distance) has not.

It has been suggested that basic and neutral nitrogen compounds present in related petroleum and source rock extracts show compositional differences indicative of migration related fractionations.[1-3] For the neutral nitrogen species studied by NRG, compared with related source extracts, migrated petroleums have:

- Greater relative proportions of carbazoles to benzocarbazoles or dibenzocarbazoles.
- Greater proportions of alkylcarbazoles with methyl groups adjacent to the pyrrolic nitrogen compared with those alkylated elsewhere.
- Increased relative abundances of more highly alkylated to less alkylated alkylcarbazoles.

The variations are consistent with a normal phase chromatographic fractionation of aromatic nitrogen species during petroleum migration.[4] It is inferred that while the principal fractionations occurred when oil moved out of the source rock (primary migration) similar, but less intense fractionations of the alkylcarbazole distributions of petroleum also occurred during secondary migration.

Comparative reservoir analysis

Figure 1 shows the benzocarbazole abundance ratio parameter benzo[a]carbazole/benzo[c]carbazole (BCP1) for five data sets derived from analysis of reservoired petroleum in five petroleum systems — two in western

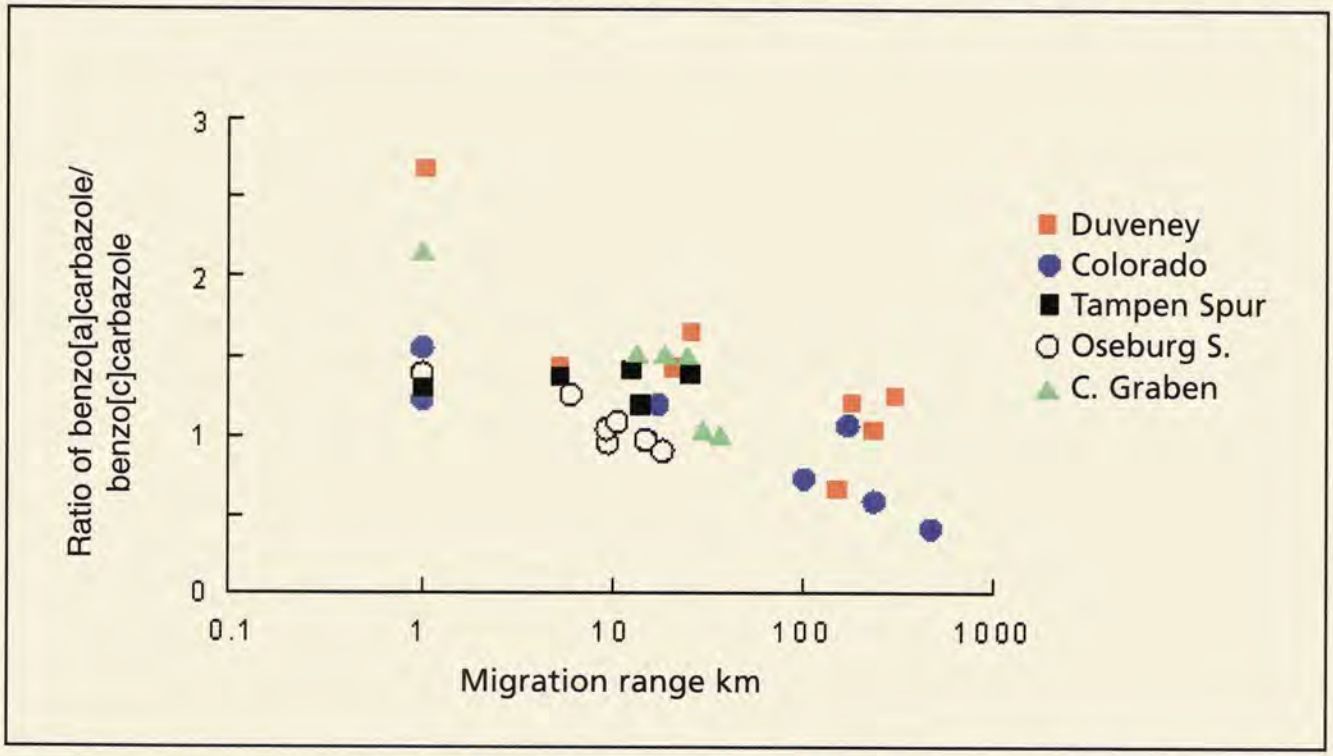


Figure 1 The ratio of benzo[a]carbazole/benzo[c]carbazole for reservoired oils from five petroleum systems plotted against best estimates of relative secondary migration range from a reference oil nearest the source rock. For ease of visualisation on this plot the reference oil is given an arbitrary migration range of 1 km.
Five petroleum systems are presented and represent oils of very similar maturity sourced from:

Set 1 — Marine shales in the Devonian Duvernay Formation;
Set 2 — Cretaceous Colorado group sediments reservoired in the Cretaceous Cardium and Viking Formations;
Set 3 — Upper Jurassic marine shales of the Kimmeridge Clay Formation and reservoired in sandstones of the Middle Jurassic Brent Group and in Upper Jurassic sandstones on the Tampen Spur area of the North Sea;
Set 4 — Upper Jurassic source rocks which have migrated through Brent Group sandstones in the Bergen High area of the North Sea;
Set 5 — Upper Jurassic Kimmeridge Clay Formation source rocks in the Central Graben into Jurassic sandstones in the UK North Sea.

Canada and three in the North Sea — secondary migration distances being the best estimates of the actual 'distances' travelled by the petroleum beyond a reference oil nearest the source rock. Of necessity, the 'migration distances' may have substantial errors associated with them.

By comparing non-degraded reservoired oils in different reservoirs, variations in composition are attributable to secondary migration or to source maturity effects. Primary migration processes are effectively removed from consideration by the choice of samples.

With the exception of the Tampen Spur data set (Set 3), general decreases of the BCP1 ratio are evident, though at large migration ranges considerable scatter is evident related to the low concentrations of nitrogen compounds present.

Both Set 1 and Set 2 represent petroleum from the foreland basin setting of the Alberta Basin. Oils of very similar maturity sourced from marine shales in the Devonian Duvernay Formation or Cretaceous Colorado Group (Set 2) are found in reservoirs at distances of up to 500 km from the mature source rocks. The petroleum systems are quite separate and isolated by a regional sealing shale.[5] The migration distances are typical of foreland basin settings. Such broad regional trends in BCP1 are seen in many of the oil suites analysed by NRG that have declining BCP1 values with increasing migration range.

To indicate that such reductions in BCP1 do not always accompany migration the third data set represents oils of a single petroleum population at various distances from the source on the Tampen Spur area of the North Sea. In this case, Upper Jurassic sourced oils have migrated through Middle Jurassic and Upper Jurassic sandstones over distances of up to 25 km. Low nitrogen compound concentrations in this set may suggest the real migration distances are much larger than indicated.

Sets 4 and 5 represent BCP1 data from two more homogeneous North Sea systems with shorter range migration. Set 4 shows BCP1 data from a suite of related oils derived from Upper Jurassic source rocks which have migrated through Brent Group sandstones in the Bergen High areas of the North Sea. The oils show little variation in maturity and are from exploration tests on a possible migration route into one of the large structures in this area. Set 5 represents data from a suite of related oils representing migration of petroleum from Upper Jurassic Kimmeridge Clay Formation source rocks in the Central Graben into Jurassic sandstones in the UK North Sea. The maturities of the petroleum increase systematically with decreasing secondary migration range — a common scenario in reservoirs that represent a sequence of progressively filled and spilling traps associated with a progressively maturing source rock.

Concentrations of benzo[a]carbazole plus benzo[c]carbazole in oil examined show general decreases in concentration accompanying increased distance of secondary migration. Benzo[b]carbazole is usually of negligible concentration in oils.

NRG has developed a normalised concentration function that shows consistent decreases in concentration with migration range somewhat independent of oil set.

The concentrations of benzo[a]carbazole plus benzo[c]carbazole decrease predominantly over the first 100 km of petroleum migration, this being a typical maximum range for most basins other than foreland basins. A combination of concentration function and BCP1 and BC ratios may prove to be a powerful tool for assessing regional migration routes and in-field charging directions.

Future focus

While further evaluation of the BCP1/BC and related parameters and concentration function proposed as secondary migration range parameters is needed, especially in petroleum systems with other types of source rocks and carrier beds, a detailed quantitative understanding of the process of removal of benzocarbazoles from petroleums during secondary migration may lead to methods for constraining computer models of the migration process. Currently such models are unconstrained by detailed observations at appropriate scales.

This emerging approach to secondary migration study may open the door to routine assessment of secondary migration range and field charging using geochemical methods.

NRG is also currently evaluating the application of such geotracer compounds to the study of petroleum migration through mudstones.

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BP Chairman to receive Cadman Medal

At its last meeting the IP Council unanimously decided to nominate Sir David Simon CBE, Chairman of the British Petroleum Co plc, for the Cadman Medal. He will receive this prestigious award from IP President David Setchell at a special ceremony to be held at the Gibson Hall on Tuesday 29 April, when he will also deliver an address entitled, 'Power, competitiveness and responsibility'.

Lord Cadman of Silverdale

The Cadman Memorial Fund commemorates the life of Lord Cadman of Silverdale, who was Chairman of the Anglo-Iranian Oil Company (now part of BP) and IP President for two spells – as Sir John Cadman in 1916-17 and later in 1935-37. The fund, contributed in his memory by friends and colleagues, provides for the endowment of a memorial lecture on some aspect of the science of petroleum.

The award is made by the Institute of Petroleum as trustees of the fund to someone of any nationality, and not necessarily an IP member, for outstanding service to the petroleum industry.

The Cadman Medal, which was designed by Mrs Gillick, bears on one side a portrait of Lord Cadman and on the other a figure holding a bowl with the inscription *'Per Ingenii Lumen Ad Scientiae Auctum'* which has been translated as 'Through the light of intelligence to the increase of knowledge.'

Sir David will join a small group of distinguished recipients of the medal. It was first presented in 1946 to Sir William Fraser, later Lord Strathalmond, Chairman of the Anglo-Iranian Oil Co. Subsequent award-winners have included Dr Paul H Frankel, Sir Eric Drake, Sir Peter Baxendell, Sir Peter Walters and, most recently, Mr L C van Wachem.

This year's recipient had a distinguished career with BP before becoming Chairman in July 1995. After studying at Cambridge University, Sir David joined the BP group in 1961 and initially held marketing posts in Europe. He subsequently attended an MBA course at the European Institute of Business Administration (INSEAD) at Fontainebleau.

From 1982-86 Sir David was Chief Executive of BP Oil International. He was then appointed a BP Group

Managing Director, becoming Deputy Chairman and Chief Operating Officer in March 1990 and Group Chief Executive in June 1992.

His outside interests are numerous and include avid support for Arsenal football club. He joined the Court of the Bank of England in 1995. He is a non-executive Director of Grand Metropolitan plc and the RTZ Corp plc. He is a member of the Supervisory Board of Allianz AG, the Advisory Board of Deutsche Bank, Vice Chairman of the European Round Table of Industrialists as well as Deputy Chairman of The Prince of Wales Business Leaders Forum.

He has been awarded an honorary degree of Doctor of Science in Economics by the University of Hull and an honorary doctorate by the University of North London. He was knighted in the 1995 Queen's Birthday Honours and awarded a CBE in the 1991 New Year Honours.

Sir David Simon CBE

Caspian production sharing

Six western oil companies – BP/Statoil, British Gas, Mobil, Total, Shell and Agip – are engaged in negotiating a Production Sharing Agreement with the government of Kazakhstan. Once this has been finalised, the group will be awarded 12 blocks in the northern part of the Caspian Sea and the government will initiate a licensing round for other areas of the sea.

By Neil Potter

A joint feasibility study of the offshore infrastructure prospects has been carried out by McDermott and Kazakhstan Caspian Shelf (KCS), with funding support from the DTI and the US Department of Commerce Trade Development Agency. Contributing companies included Cairns of Edinburgh (environmental management and design); Consolidated Supply Management of Aberdeen (logistics); Environmental & Resources Technology of Stromness, Orkney (marine environment); KCA Drilling, Aberdeen (technical support) and Walfords of Edinburgh (chartered quantity surveyors).

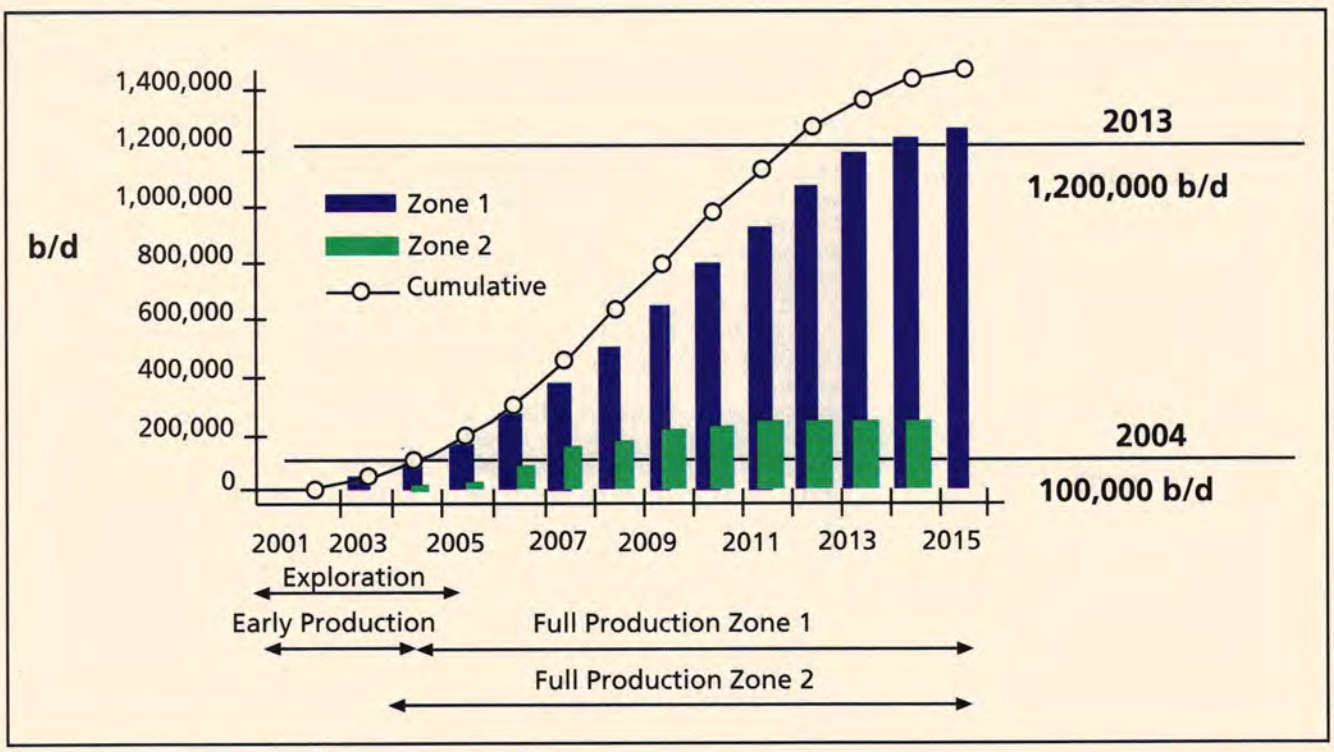
Caspian survey

The oil companies will be faced with immense problems — environmental, logistical and operational. Total estimated capital and operational expenditures for the offshore and onshore infrastructure facilities are:

- Onshore capex – $5.49 billion
- Onshore opex – $3.37 billion
- Offshore capex – $7.11 billion
- Offshore opex – $6.97 billion

These figures are based on a production target of 100,000 barrels per day (b/d) by 2004 and 1,200,000 b/d by 2013.

The northeast sector of the Caspian Sea has a high degree of environmental sensitivity. It has a variety of low salinity shallow water environments which provide spawning, nursery and feeding grounds for a wide range of fish species.



Assumed production targets

The area is subject to long-term sea level changes and short-term storm-induced sea level surges and retreats. It is covered in ice for some four to five months a year.

It is divided into Zone 1 (north of Karaganski Bay, with less than 10 metres water depth) and Zone 2 (south of Karaganski Bay, with less than 500 metres water depth).

Drilling constraints

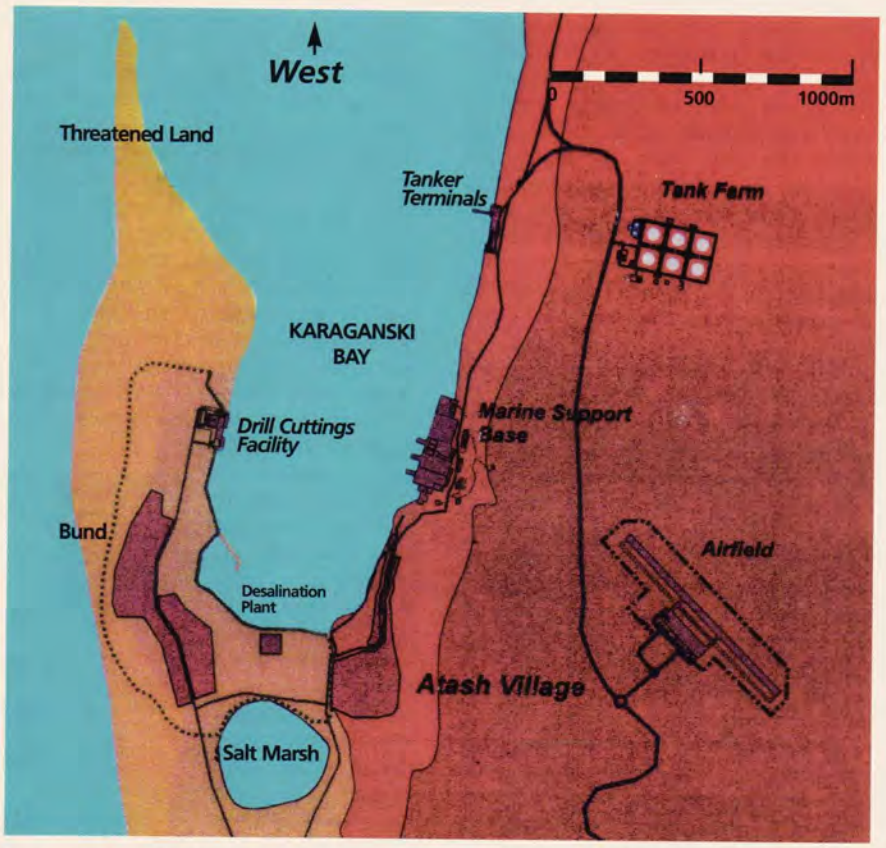
Exploration drilling in Zone 1, where the presence of ice and freezing conditions in the winter months imposes a number of operational restrictions, is expected to begin in 1998-99 using one of the various options available. These include posted drilling barges, purpose-built barges to support the drilling rigs, self-elevating barge-mounted rigs and an artificial island utilising an existing land drilling rig.

But no matter which option is selected, the appropriate rig or required support/construction equipment does not exist in the area. A further complication will be having to cope with the high temperature, high pressure sour crude wells. This will increase the lead time for procuring the specialised equipment and ultimately the delivery of the drilling rig to the Caspian.

Even if the equipment is available in the west, it still has to be brought into the Caspian via the Volga River or the Volga Don canal which can only cope with a limited amount of traffic during the summer season (April through October).

A drilling programme could have two rigs operating in 1999, to drill two wells, rising to six rigs in 2001 with 12 wells drilled. From 2002 there could be eight rigs which would, by 2006, have drilled a total of 52 wells.

The report points out that any exploration drilling schedule for Zone 1 will have to comply with the zero discharge criteria. This will necessitate a large number of vessels to transport discharges from the offshore facilities to the shore. Such vessels do not exist in the area and will have to be fabricated or brought in. Onshore facilities will have to be built to treat drill cuttings, produced water and solid waste.



Early oil production was considered assuming that 100,000 b/d would be produced from a four platform complex by the year 2004. The scenario was to stabilise the crude offshore and transport (a minimum of 80 percent) to shore via a 20-inch pipeline with the remaining 20 percent being tankered to other locations in the Caspian during the ice-free months.

Pipeline plans

Assuming that substantial recoverable reserves exist, it was decided that full production 36-inch and 40-inch pipelines should be installed in 2000 in lieu of the early production lines.

Two pipeline routes were studied — a 100-km line to a site 40 km east of

Atyrau and a 125-km line to a site near the existing Tengiz facilities. The Tengiz option is considered more desirable, being less environmentally sensitive from a construction point of view; the sulfur recovery plant to handle an expected throughput of 24,000 tonnes a day will be located in a remote area.

Export of the crude either to Novorossiysk via the proposed CPC pipeline or via another pipeline to the south makes the Tengiz area the logical location.

The options for early production/ wellhead platforms in shallow water (2 to 8 metres) are: grounded steel barges enclosed in a bund area, concrete caissons or artificial islands.

The favoured option for the full production target is for seven 150,000 b/d wellhead platforms with one wellhead and gathering platform. The combined production is separated into oil and gas on the gathering platform and brought to onshore processing facilities via a 46-inch gas pipeline and a 36-inch oil pipeline.

The platform options are the same for the early production phase with the grounded/piled steel barge approach being preferred. But this is with the understanding that artificial islands and concrete caissons may play a significant role pending soil surveys and the availability of adequate construction facilities.

It is expected that in Zone 2 conventional techniques will be utilised for exploration drilling, through construction and production. The assumed crude characteristics will not dictate the need for exotic materials. Offshore production facilities could comprise two conventional platforms with a 610-mm single-phase oil pipeline and a second line if gas is produced.

Supply bases

One of the keys to the success of the offshore development will be the ability to supply the needed materials and equipment in accordance with the construction schedule. Three locations were considered for both zones: Atyrau, Karaganski Bay/ Bautino and Aktau.

Karaganski Bay is the only natural harbour in the Kazhak sector of the Caspian and is ice free except in the most severe winters. It is well positioned between the northern and southern fields as well as adjacent to the central fields. It is therefore judged to be the location for the primary marine support base for both zones. However, it is a greenfield site in a fishing village which will have to be developed from the ground up with marine support base, tanker terminal, tank farm, drill cuttings facility, airfield as well as housing and facilities for vendor companies.

Atyrau, with its existing infrastructure, will play an important role. Before Karaganski Bay is developed, it will provide direct support in the form of area operations and administration, maintenance and waste disposal, communications, logistics, marine vessels and helicopters.

Once the marine supply base has been established at Karaganski Bay, vessel support operations, maintenance and waste disposal will be moved to that facility. Area drilling and production operations as well as administration, communications and helicopter support will continue from Atyrau.

Aktau will contribute to the development programmes through its skilled labour and extensive industrial infrastructure.

Personnel needs

Another essential element to achieving the offshore development goals is an adequate supply of properly trained personnel. Thus the necessary training programmes will have to be integrated into the overall development scheme.

The report warns, too, that there is the possibility of concurrent offshore developments in other Caspian Rim countries including Azerbaijan, Turkmenistan and Dagestan. This will increase the pressure on existing supply lines and infrastructure.

Qatari LNG starts flowing

The first of the three 2 million tonnes/year liquefaction trains for the LNG plant built by the Qatar Liquefied Gas Company (Qatargas) in Ras Laffan was commissioned last September when exports of around 30,000 barrels per day of condensates began. Two months later, contractors Chiyoda of Japan delivered the facilities for the second train. The first Qatargas LNG shipment, for Japan's Chubu Electric Corporation, was scheduled to leave Ras Laffan at the end of last year. The third liquefaction train is expected to become operational in 1999.

By Dr Naji Abi-Aad
Energy Consultant

Qatargas was set up in November 1984 as a joint venture between the Qatar General Petroleum Corporation (QGPC), BP and Total but both Mitsui and Marubeni subsequently acquired a 7.5 percent stake, reducing the holding of the QGPC to 70 percent. BP decided at the end of 1991 to withdraw from the project. This step was followed in August 1992 by the provision of a 10 percent stake for Mobil.

Nevertheless, shareholders and operators in Qatargas differ in the upstream and downstream sectors. The upstream part (QGPC 65 percent, Total 20 percent, Mobil 10 percent, and Marubeni and Mitsui 2.5 percent each) for gas extraction, separation, and marketing of liquids, is operated by Total. The downstream part (QGPC 65 per cent, Total 10 percent, Mobil 10 percent, and Marubeni and Mitsui 7.5 percent each) for liquefaction, marketing and transportation of LNG, is operated by Mobil. The total cost for the project is about $6 billion composed of 17 percent for the upstream sector, 50 percent for the liquefaction trains and related facilities and 34 percent for the LNG carriers.

To secure export outlets for its gas, Qatargas signed an agreement with Chubu for the export of LNG over a period of 25 years starting this year. Under this agreement, Chubu undertook to lift 2 million tonnes of LNG in the first year, which will be increased in stages to 4 million tonnes from the fourth year. In January 1995, a consortium of seven Japanese gas and electricity utilities (Tokyo Electric Power Co, Tohoku Electric Power Co, Tokyo Gas Co, Osaka Gas Co, Toho Gas Co, Kansai Electric Power Co and Chugoku Electric Power Co) agreed to purchase another 2 million tonnes of LNG annually from Qatargas over a 25-year period starting this year.

Qatargas has set up a new subsidiary, Qatarship, to move its exports of LNG. Qatarship will operate a fleet of seven 135,000 cubic metre methane tankers, rising to 11 once the third liquefaction train comes on stream. The original plan was for Qatarship to purchase new tankers built to order but Qatargas then decided to charter the tankers instead. To that end, Qatarship signed a 25-year contract with five Japanese shipping lines – Mitsui OSK Lines, Showa Line, Nippon Yusen Kaisha, Kawasaki Kisen Kaisha and Kaiun Kaisha.

Qatargas is part of the huge development project of the North Field gas field. This is one of the largest in the world, with total reserves in place estimated at 10,765 billion cubic metres. A first phase of the field development project came on stream in 1991, compensating for the increasing shortfall in associated gas used for the domestic market. In addition to Qatargas, other projects have been mentioned but so far have not materialised, with the exception of Ras Laffan LNG.

Ras Laffan LNG

Under an accord signed in 1992, QGPC and Mobil agreed to set up a joint venture, Ras Laffan LNG Co (Rasgas), to develop part of the North Field and produce LNG for export. Mobil is the new company's operator with a 30 percent interest.

The liquefaction plant of Rasgas, to be built at Ras Laffan, will have an initial capacity of 5 million tonnes/year with two 2.5-million tonnes/year trains, a capacity which is to be expanded to 10 million tonnes/year at a later date. Although the Rasgas project is independent of Qatargas, the infrastructure of both schemes will be integrated to reduce costs and facilitate production, transportation and export.

The scheduled start-up date for the

project is August 1999. Its total cost is estimated at around $4.5 billion composed of 24 percent for the upstream sector, 44 percent for the liquefaction trains and related facilities, and 32 percent for the LNG carriers. The doubling of the scheme's capacity would cost around $6.1 billion.

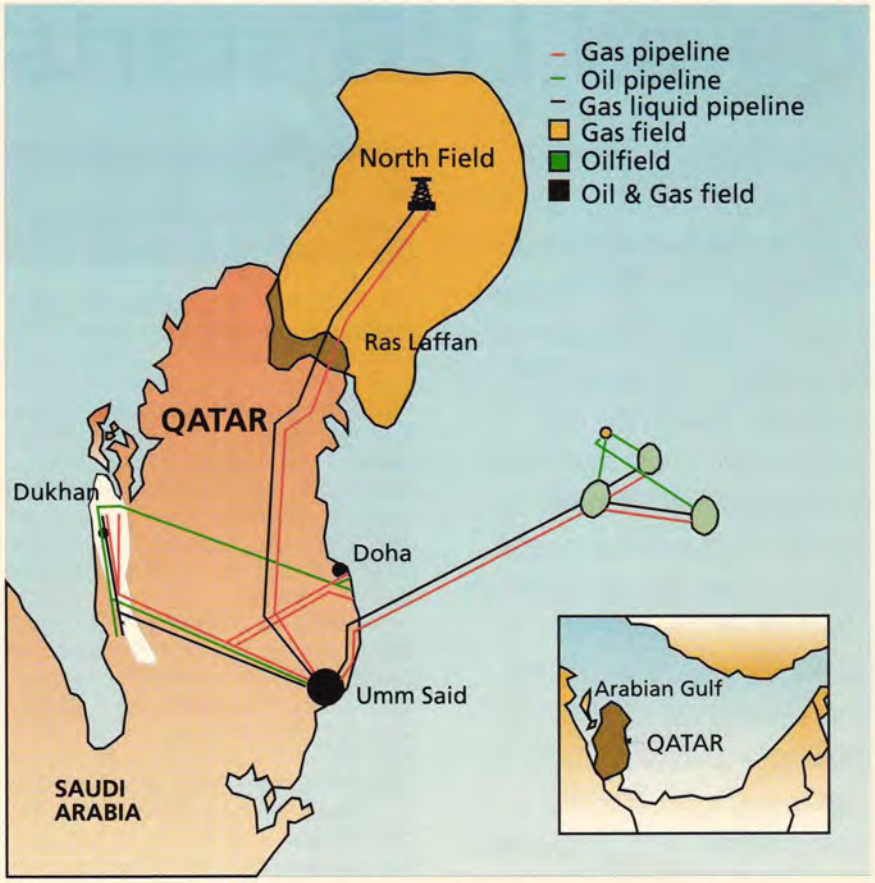
In September 1995, Rasgas signed a sales-and-purchase agreement with the South Korean company Korean Gas, selling up to 2.4 million tonnes/year of LNG for 25 years starting in 1999. Meanwhile, since early 1994, letters of intent for LNG export have been signed between Rasgas and each of Taiwan's China Petroleum Corp (2.1 million tonnes/year), Botas (2 million tonnes/year, plus an option for another 2 million), Wing Group of China (2.5 million tonnes/year) and India's Essar Group (2 million tonnes/year).

Enron

In January 1995, Enron signed a non-binding letter of intent with QGPC to develop another project costing about $4 billion and aiming to export 5 million tonnes/year of LNG over a 25-year period starting in 1999 or 2000. Enron has a 40 percent share in the project and QGPC the rest but Enron's share will decline later to 35 percent. Planned exports would go to India (2.5 million tonnes/year) and Israel and its neighbours (2.5 million tonnes/year), for which two letters of intents were already signed in December 1994 and October 1995 respectively. The agreements with India and Israel have since been running into troubles, however.

Eurogas

QGPC signed an agreement in June 1992 with SNAM, part of the Italian ENI group, and Nelson Bunker Hunt for a $7.5-billion project to produce, transport and market LNG in Italy from the North Field. The project would have been carried out by Qatar Europe LNG Co (Eurogas), a joint venture in which QGPC would have had a 65 percent stake, with 30 percent to be held by SNAM and 5 percent by Hunt. A liquefaction train with an initial capacity of



6.1 million tonnes/year was to be built alongside the Qatargas unit at Ras Laffan. It was planned to expand its capacity later to 9.2 million tonnes/year and the extra LNG would then be sold on other European markets.

However, Eurogas partners were unable to agree on the gas prices. Consequently, in February 1994, the foreign partner shares were transferred back to QGPC, which has kept the venture as a legal entity, although the project itself was shelved.

Elf/Sumitomo

In July 1992, Elf Aquitaine announced an agreement with the Japanese trading company Sumitomo Corporation to carry out the feasibility study for a project to develop gas from the North Field to supply a 4-million tonnes/year liquefaction plant. The project would have cost an estimated $5 billion.

The Elf/Sumitomo study covered both the upstream and downstream parts of the project, including the construction at Ras Laffan of a liquefaction plant composed of two production line trains, the purchase of methane tankers and the possibility of bringing in other partners to help spread the costs. Elf would have been the operator on the field and Sumitomo would have taken charge of lining up finance for the project, shipping and bringing in the contracts with European, Japanese or other Asian gas clients, which was an essential step to get the project off the ground. Nevertheless, Elf and Sumitomo were unable to secure letters of intent from consumers for the purchase of their planned LNG. Consequently, in late 1994 their project was shelved.

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Tuesday 29 April

At the Gibson Hall,
Bishopsgate,
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'Power, Competitiveness and Responsibility'

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Admission, which will be strictly by ticket only, is free of charge.

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61 New Cavendish Street
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'The Impact of Improved Catalytic Processes on Refinery Economics'

To be held at the Institute of Petroleum

Thursday 10 April

The major refinery upgrading processes in use today depend for their success on the performance of catalysts. Yields and product qualities achieved with the right catalysts and processes are all important to the end results. In recent years, constant improvements to the catalysts themselves, and to the technology used in applying them, have been of major benefit to overall refinery economics.

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Who should attend?
In a world of tightening refining margins and increasingly stringent environmental product specifications, all those concerned with this area of the industry should hear the latest developments for themselves — whether they are concerned with the nuts and bolts of the business or just the accumulation of those dollars (Euros?).

For a copy of the programme and registration form, please contact:

Pauline Ashby,
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61 New Cavendish Street,
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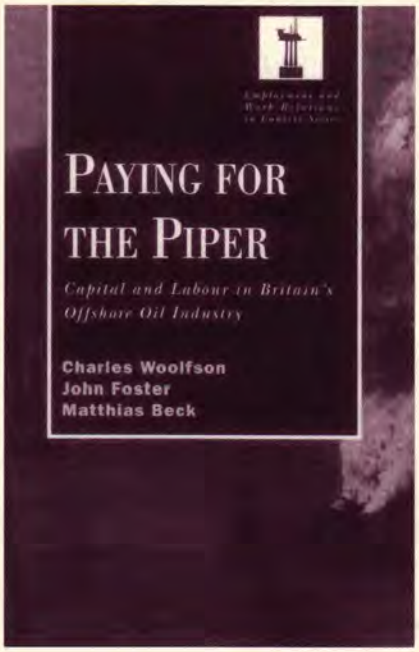
Tel: 0171 467 7100
Fax: 0171 255 1472

Paying for the Piper

By Charles Woolfson, John Foster and Matthias Beck

Published by Mansell Publishing Limited. 603 pages. ISBN 0 720 123488 (hardback), price: £65. ISBN 0 720 12350X (paperback), price: £25.



The editors of the 'Employment and Work Relations in Context' series to which this book is a contribution state that 'a particular feature is the consideration of forms of worker and citizen organisation and mobilisation.' The last paragraph of the book contains the following two sentences: 'Those who control the UK oil and gas industry remain convinced that their interests are incompatible with the presence of organised labour and the right to collective bargaining. This conviction is the story of our book.' It also sets the tenor of the book.

From the outset the oil and gas industry on the UK Continental Shelf has opposed the introduction of collective bargaining with its associated recognition of trade unions and has sought to develop relationships with its employees through the alternative process of joint consultation. The authors claim that this policy has allowed the employers to pay insufficient attention to the maintenance of safe working environments and they have sought to substantiate this thesis through an analysis of three inter-related factors: the economics of the industry at both transnational and national (UK) levels, the safety regime offshore both before and after Piper Alpha and the efforts of the trade unions to secure collective bargaining rights.

Oil is a commodity vital to industrialised economics and inevitably the industry wields power on a worldwide scale. The book provides a useful commentary on the economics of the industry in general but when it comes to the North Sea it suggests that there is an ongoing conspiracy between UK governments and the oil companies, particularly Shell and BP, whereby safety is sacrificed in the pursuit of revenues. CRINE (Cost Reduction Initiative in the New Era) is subjected to particular criticism on the grounds that expenditure necessary to maintain and to improve safe working practices has inevitably been curtailed in the interests of cost saving. This is a bit hard on employers who have spent £5 billion on accident prevention since Piper Alpha in 1988 and to call in aid the fatality figures of 1995-96 (five compared with one the previous year) smacks of special pleading. Great play is made of the relationship between the safety regulators before and after the Cullen Report. Few would deny that the Petroleum Engineering Division of the Department of Energy had too close a relationship with the employers to be as effective a regulator as it should have been but the authors assert, with little real evidence, that the employers have now captured and contained its successor, the HSE Offshore Safety Division. There is reference here to some sociological research of over 20 years ago but no mention anywhere in the book of Aberdeen's own Professor Alex Kemp who has shown that if costs can be reduced the industry will grow in size because the lives of the existing fields will be extended and new, previously uneconomic fields will be developed.

Any death or serious injury anywhere is to be deplored and Occidental was properly excoriated by Lord Cullen for its lack of proper commitment to accident prevention on Piper Alpha. One can only speculate whether trade union influence could have prevented that disaster. The Norwegian trade unions have the right in law to be represented on safety committees but that did not prevent the loss of 123 lives in the Alexander Kielland disaster in 1980. British trade unions have much expertise in safety matters which is brought into play through their membership of the Offshore Petroleum Industry Training Organisation but until they secure significant and permanent membership on installations the current practice of employee as distinct from trade union appointees to mandatory safety committees must be made to work.

The most persuasive sections of the book explain how organised labour, debilitated by inter-union disputes, achieved no more that a few toeholds offshore. That the majority of offshore

Offshore safety facts

In response to the publication of *Paying for the Piper*, the UK Offshore Operators Association (UKOOA) sent out a press release with the following information:

1. All 48 of Lord Cullen's Recommendations were implemented by the industry within two years of their publication.
2. Acceptance by the HSE of all the offshore Safety Cases, for over 220 installations, after a three-year programme of exhaustive study and analysis of design and operations.
3. Implementation of full Safety Management Systems as an inherent part of Safety Cases.
4. A 48 percent reduction in injury frequency between 1988-89 and 1994-95.
5. Significant improvement in the industry's safety record compared with other industries. In 1986-87 there were eight other industry sectors which had higher injury frequencies; in 1994-95 there were 33, including mining, railways, metal manufacture, water supply and construction.
6. When all planned work is complete, the HSE predicts that the risk of significant accidents with multiple fatalities will be reduced to about one-tenth of the level it was in 1988.
7. All installations have a Safety Committee at which Safety Representatives formally meet the Installation Manager to discuss any and all current safety subjects for that installation.
8. Safety Representatives on offshore installations are elected by their fellow workers to represent their interests and concerns. Each Safety Representative is elected by no more than 40 fellow workers and this level of representation may be increased significantly if different types of work are involved. Issues discussed range from the installation Safety Case to on-site working procedures and UKOOA Guidelines.
9. Safety Representatives are trained to fulfil their role, which includes an understanding of safety legislation and the identification of potential safety hazards.
10. The HSE engaged Aberdeen University to conduct a full review of the working of the Offshore Safety Representatives/ Safety Committee structure in 1995. The report concluded that the system was working well; the only significant recommendation was that Safety Representatives needed more training in communication capability. The industry is therefore addressing this matter and is producing revised proposals for training of Safety Representatives to accommodate this aspect and other lessons already learned.
11. Fully in line with Lord Cullen's Recommendations, UKOOA and industry resources have worked hard to produce guidance, to describe good industry practice for a large number of offshore operational areas, for example Guidelines for Medical Aspects of Fitness for Offshore Work; Guidelines for Offshore Emergency Drills and Exercises on Offshore Installations; and Guidelines for the Safe Management and Operation of Offshore Support Vessels. Lord Cullen said that such Guidelines, if produced by industry itself, would be realistic and would be more fully adhered to. Guidelines are invariably sent to the HSE for consultation before they are issued within the industry and guidelines are also subject to workforce involvement and contributions from all other relevant industry associations alongside UKOOA. In specific instances, international consultation is appropriate, involving UKOOA sister organisations in other European countries.

employees simply did not want to join trade unions is, however, given insufficient credence; some recruits in the late 1970s saw employment offshore as a refuge from trade union harassment, while a significant proportion of employees were ex-servicemen unaccustomed to querying orders. Also by the 1980s many oil workers had values more associated with the middle classes through investment in houses and small businesses.[1]

Of particular interest is the account of the generation of the Offshore Industry Liaison Committee (OILC), the small but tough trade union, which, despite problems and setbacks, retains its independence and has forged close links with another 'rebel' union, the larger Norwegian OFS. OILC played a leading role in the industrial disputes offshore in 1989 and 1990 but the authors have invested these strikes with greater significance than they deserve.

Many will disagree with the conclusions which the authors have drawn from what has happened on the UK Continental Shelf over the last 25 years. They have, nevertheless, produced a monumental work replete with facts and figures which will remain a standard work of reference for many years.

D H F Gourlay, Research Fellow, The Robert Gordon University, Aberdeen

[1] H Bygate (1976) *Oil over Trouble Waters,* Aberdeen's People's Press; M Jones and F Godwin (1976) *The Oil Rush,* Quartet Books, London; A Alvarez (1987) *Offshore – A North Sea Journey,* Sceptre Press, New York.

15th World Petroleum Congress
Beijing, China
12th-16th October 1997

Technology and Globalisation Leading the Petroleum Industry into the 21st Century

Within this theme, the Congress will address itself to scientific and technical subjects, economics, safety, environmental matters and managerial issues. Acknowledging recent achievements, the Congress will deal with the challenges of the next decade.

The **Plenary Addresses** by world renowned speakers will give strategic overview of developments and prospects in technical and managerial fields of interest to the industry as a whole and will include **Wang Tao, President of China National Petroleum Corporation, L R Raymond, Chairman of Board and CEO Exxon Corporation, P H Jaffré, Chairman of Board and CEO Elf Aquitaine, Rilwanu Lukman, Secretary General of OPEC, A E Putilov, Chairman Rosneft, and K T Derr, Chairman of Board of Chevron Corporation (Dewhurst Lecture).**

- The Opening Ceremony and Welcome Reception will be held in the Great Hall of the People, Beijing, the Congress and Closing Ceremony at the China World Trade Center.
- **21 forums** will consider, in the context of the Congress theme, particular areas of the petroleum industry in which there are significant current activities and in which important new developments are envisaged. At each forum four or five major papers will be presented, as a basis for discussion on the platform and with the audience.
- **10 review and forecast papers** will review progress and summarise state of the art technology, current research and future trends in specific areas of high interest.
- **250 posters** on technical topics will lend themselves to visual presentation and individual discussion with the presenters.
- **A Ministerial Panel** of two hours will offer Ministers an opportunity to discuss issues of concern to them.
- A full social programme with daily sightseeing for accompanying persons; an extensive programme of site visits and post-congress tours has been arranged.
- The International Petroleum and Petrochemical Exhibition 1997 will run concurrently. Entry and transfers will be free to WPC participants.
- An additional optional 1-day programme on the Chinese petroleum sector will follow the Congress on Friday 17th October 1997.

Copies of the free technical programme, congress programme and registration form can be obtained from any WPC national committee or:

WPC-97 Secretariat, China
Zhai Guangming, Secretary General
PO Box 766
Liu Pu Kang
Beijing 100724 China
Tel: +86 10 6209 5455/5446
Fax: +86 10 6209 5447/5459

WPC Secretariat, London
Paul Tempest, Director General
61 New Cavendish Street
London W1M 8AR
United Kingdom
Tel: +44 171 467 7100/7137
Fax: +44 171 580 2230 or

Carriage of Dangerous Goods by Road Regulations 1996 Regulation 11(1)(a) and Schedule 3 – road tanker fill lids/fire engulfment relief valve

The Health and Safety Executive wishes to draw attention to a recent incident and the need for operators to take appropriate action.

Following a roll-over incident involving a road tanker carrying petrol, it was found that product had been released from the fire engulfment relief valve (fe valve – also known as the fill lid). The requirements relating to the performance of the fe valve have always been interpreted as allowing a release of product due to the initial shock loading but the valves should immediately reset and reseal. In this incident a number of the fe valves did not reseal. The reason for this has been found to be a deterioration of the spring performance. In one case the spring was so badly corroded that it was completely inoperative. Additionally it was found that the sealing gasket on some of the 'lids' had also deteriorated so as not to provide a seal.

All operators of road tankers should take note of the circumstances described above and should note that the circumstances may describe a contravention of the requirements of the above-mentioned regulations.

All operators are advised to ensure that the maintenance schedules of their tanks include a regular examination, and testing where necessary, to ensure correct functioning of all safety relief valves and a leak test of fittings.

Where a safety valve, such as the fe valves on this road tanker, is designed to allow maintenance and adjustment by persons other than the manufacturer, the instructions given by the manufacturer should be followed and the maintenance and adjustment should be carried out by persons who are competent to do so.

Where a safety valve is not intended to be subjected to maintenance etc other than by the manufacturer, then the valve should be returned to the manufacturer or his agent for attention when this is necessary.

The Carriage of Dangerous Goods by Road Regulations 1996 also require that the periodic examination and testing are carried out by a competent person in accordance with a written scheme. All operators should ensure that the written schemes for their tanks and fittings include the safety valves. It is my opinion that the written scheme should include not only a visual examination but also testing of the valve where deterioration of performance is suspected.

Competent persons who carry out the periodic inspection and testing should also ensure that they include all fittings which could affect safety in transport. It is my opinion that the periodicity of such examinations should, in part, be decided upon in the light of the maintenance schedule. Competent persons are reminded that Regulation 6(c) places a duty upon them in relation to examination, testing and certification of any tanks.

P G Castle

INTERTANKO guidance on oil cargo losses and problems with measurement

INTERTANKO recently published the second edition of its guidance paper *Oil Cargo Losses and Problems with Measurement*. The document is aimed at assisting members to deal with financial claims that may arise in crude oil shipments, particularly in two crucial areas – the on-board measured cargo quantity versus bill of lading quantity and the retention of residual quantities of crude oil on-board ship after discharge of cargo (ROB). The intentions are to afford protection for the cargo against 'unexplained' shortage and to provide a defence for owners against unjustified claims that may be lodged by charter parties.

The paper addresses the major issues normally associated with claims against the ship. Details of the technical aspects of crude oil cargo measurement are explained and areas where apparent losses may arise highlighted. In addition, summaries are given of various international agreements covering the subject, while the legal position and obligations of ship owners are clarified. The paper recommends actions to be taken by owners to protect their position in the event of dispute.

The document offers a definition of 'pumpable' and 'non-pumpable' cargo for use in cargo retention clauses. This is a particularly contentious issue since it is used to define whether material remaining on-board the ship should have been pumped off during the discharge, or whether its retention is unavoidable owing to the physical characteristics of the ROB product and/or the construction characteristics of the vessel. Cargo retention clauses from various contracts are presented, together with accounts of arbitration decisions in New York and London.

This is a practical document that should prove of value to both ship owners and charterers involved in crude oil shipping movements.

The IP Marine Loss Control Committee, PM-L-4, was one of the bodies consulted by INTERTANKO in the drafting of this paper.

J M Wood

Modern asset pricing – a map of the future?

A group of Canadian and British financial rocket scientists headed by Professor David Laughton of the University of Alberta has developed a new method of assessing the value of capital investments. They call their improved mousetrap Modern Asset Pricing or MAP. It remedies some of the more glaring and widely acknowledged deficiencies of the traditional discounted cash flow, internal rate of return (DCF/IRR) methods used to estimate financial returns.

By Peter Adam

DCF/IRR models, despite their limitations and biases, are now applied universally throughout academia, industry and finance, even though they do not differ significantly from approaches financiers and titans of industry used to evaluate the returns of the first major capital-intensive enterprises, such as railways, steel mills and the like in the 19th century, long before modern futures markets came into being.

MAP brings cash flow discounting and internal rate of return estimation, way overdue for an overhaul, fully into the 20th century.

Prof Laughton and two of his colleagues, Gordon Salahor, of Ernst and Young in Calgary, and James Markland, of British Gas E & P in Reading, presented MAP at the International Association for Energy Economics (IAEE) Annual Meeting in Boston last October.

MAP seems destined to have a growing impact on the operations of extractive industries and can be modified for use by practically any capital-intensive enterprise. Already some are reported to be using it.

MAP supersedes and builds on DCF/IRR, enhancing it with decades-old and widely accepted analytical tools such as the Black-Scholes Options Pricing Model and Monte Carlo estimation techniques.

MAP factors in the various ways companies can structure projects and assesses the impact these choices have on their rates of return. It also acknowledges that enterprises' risk management activity, hedging by means of financial instruments, has an impact on project risk assessment. MAP is capable of adjusting financial return projections accordingly.

Both DCF/IRR and MAP discount estimates of periodic cash flows. DCF/IRR uses factors, sometimes known as hurdle rates of return, based on enterprises' capital costs for project assessment. For different projects, these are adjusted with premia and discounts reflective of the risks various investments are thought to entail, relative to the riskiness of the entity as a whole.

According to the Capital Asset Pricing Model (the underlying theoretical construct on which DCF/IRR modelling rests) project discount rates must be consistent with two major benchmarks – a company's beta and the 'risk-free' rate of return. Beta is the correlation of the performance of an enterprise's share price to the equities market as a whole. In the United States, it is usually measured relative to the S& P 500, as proxy for the entire stock market. The 'risk-free' rate is the discount US Treasury bills, or similar instruments fetch in the market.

In addition to congruency with the benchmarks, project discount rates must also reflect, as appropriate, political risks, currency risks and operational risks, such as – in upstream oil and gas operations – geological and technical risks, attributable to projects specifically.

Companies go to great efforts to ensure that they get as much bang for the buck as they can. Their investments are supposed to yield as much over the 'risk-free' rate as possible; and do so without adding to the markets' perception of enterprise risk, which can raise capital costs. MAP allows companies to achieve both aims with greater exactitude than current DCF/IRR methods permit.

Discounting discount rates

The first major improvement MAP represents vis-a-vis DCF/IRR is that it does not use project discount rates as an input, rather it derives them as an output. MAP does this by breaking out different components of project cash flow. It factors in project costs, which can often be estimated more accurately than revenues, differently.

In extractive industries revenues are dependent on the often inscrutable vagaries of commodity markets. They are difficult to project with any certainty. MAP applies Monte Carlo estimation techniques and the Black-Scholes Option Pricing formula, forwards and backwards, based on futures prices, historical volatility patterns and demonstrated

tendencies to recover from shocks.

MAP also factors in companies' risk management capabilities and adjusts projects' net present value and rate of return calculations accordingly. Prof Laughton's model adds together the differently calculated components of cash flow.

Then, in a second major departure from conventional DCF/IRR methods, MAP takes project financial projection a step further by generating different possible future scenarios through the application of decision trees whose nodes represent different project structures. Management often can build in high or low operating leverage into a project. MAP factors in the degree to which fixed and variable project costs can impact the effect that changes in revenues have on project profits and cash flows. It thus provides a much clearer picture of the range of possible returns a project can generate than conventional DCF/IRR methods.

Transforming the way companies invest

Using MAP can have a dramatic impact on projects' returns and the ways companies invest. Research carried out by Mr Salahor indicates that the failure of conventional DCF/IRR methods to incorporate projects' operational characteristics has prompted companies to make suboptimal investment choices systematically.

DCF/IRR, he notes, does not properly deal with differences in project risk associated with operating leverage; it biases project selection towards higher risk, shorter-lived ventures. DCF/IRR does not recognise difference in projects risks where revenues are incorporated into risk management arrangements. So it assigns no value to managing corporate risks using appropriate financial instruments. Furthermore, applying unmodified DCF/IRR to commodity price revenue streams implies an ever-increasing level of uncertainty about future commodity prices. Thus it fails to factor in the long-term impact of supply and demand. As a result, he points out, project discount rates are often excessive and companies biased against longer-term projects and those with production plateaus.

According to the researcher, because of oil companies' use of the highly flawed, unmodified DCF/IRR approach, the world is littered with underutilised petroleum production facilities. Operations are overly sensitive to commodity price volatility; older facilities are continually faced with shutdown and in many cases with unnecessary cost-cutting to extend asset life. Thus, as he charitably puts it, 'The industry delivers low returns on capital.'

Against the odds

In his fascinating book, *Against the Gods* (John Wiley, 1996), Peter Bernstein demonstrates that the inability of mathematicians to formulate rigorous answers to questions about risk hindered the development of commerce for centuries. Enterprises lacking reliable methods of assessing different future possibilities could not insure activities properly or engage in complex operations successfully. He notes though that once a handful of creative thinkers and statisticians laid the groundwork in the 19th century via modern probability theory and risk analysis, contract exchanges of goods and services boomed.

The modern tools of financial analysis that Prof Laughton has incorporated into MAP have been available to oil and gas companies for quite a while. (Practically all of the modern theoretical work in finance stems from the early work of Harry Markowitz, winner of the 1990 Nobel Prize in Economics, whose Portfolio Selection was published in 1959, while the Black-Scholes Option Pricing Model has been around since 1973, the year the Chicago Board Options Exchange opened for business.) The failure of oil and gas companies to use the tools of modern financial management has cost them dearly. They have ceded millions, perhaps hundreds of millions of dollars to banks, trading companies, and 'Wall Street refiners' because financial institutions, in stark contrast to the oil business, have applied to their activities the analytical techniques Prof Laughton and his colleagues have now used to transform DCF/IRR into their MAP construct. This, as Mr Salahor points out, has contributed to lacklustre performance in many oil and gas companies.

Not in our stars ...

Why the petroleum and perhaps to a lesser extent extractive and capital-intensive industries generally have taken so long to catch on is perplexing. Perhaps true innovation goes against these industries' prevailing ethos. As the chief economist of one major US oil company noted at the IAEE meeting where Prof Laughton and his colleagues presented MAP, 'There's still an old boy network at work in the upper echelons of the petroleum business.' This certainly does not help. The economist went on to predict that companies whose corporate cultures remain highly flawed in this and other ways will not survive.

It has been your correspondent's experience that Prof Laughton and his colleagues as well as the aforementioned economist are on the money. Far from being a mathematically precise exercise, capital allocation – as currently practised by many major oil companies – involves an excessive amount of taffy pulling, favour swapping, log rolling, back scratching and stabbing. And more often than not, such machinations are followed by big-time major numbers massaging to stack the DCF/IRR deck in favour of projects whose proponents have won out. The corporate apparachicks and political hacks whose number one rule of survival is to be transferred and promoted before there are post-completion audits of their projects are in many cases intellectually incapable of grasping the deficiencies of the DCF/IRR approach and how MAP remedies them.

Despite the crude-driven runup of major oil share prices last year and the industry's current urge-to-merge orgy, look for at least a couple of the majors, complacent ones who will fail to use the right MAP, to stumble in the years ahead.

Soon the world is likely to be beating a path to Prof Laughton and his colleagues. Perhaps more companies in the petroleum industry should take serious note.

Development of new values for toluene standardization fuels for the measurement of octane number

Since the development of engine test methods for the determination of the octane number of automotive and aviation gasolines, a means of 'fit-for-use' qualification of the test engines has been a requirement. The objective of such qualification is to ensure that the combination of test engine condition and operatlng conditions is within close limits, so that a rating performed on a fuel of 'known' octane number comes within a given prescribed tolerance.

By T J Berryman, Consultant and L Mayhew, Lindsey Oil Refinery

Over time, fuels used for this qualification test have become more closely defined and slightly more sophisticated, through a series of benzene/heptane blends used in the 1930s, the 'X-fuels' (mixed aromatics/heptane) of the 1940s, to the 'pure' toluene/heptane blends developed in 1954 and introduced in 1956.

By the early 1960s, it was realised that the sensitivity of octane number to engine conditions in full-range gasolines was better represented by a blend that more closely matched the gasoline under test. As a result, specific blends of toluene, heptane and 2,2,4-trimethylpentane (iso-octane) were constructed to cover the whole range of octane numbers normally encountered in the automotive market. Each blend was multiple tested and assigned both an RON and MON value plus a tolerance limit based on a statistical evaluation of the testing programme. These values first appeared in 1967 as the new 'fit-for-use' qualification requirements and remained unchanged and unchallenged until around 1984.

By 1984 however, an increasing number of engines, particularly in the United States, were finding difficulty in gaining qualification for daily octane testing and failure was almost universally high. Following the installation of a substantial number of engines in China, that similarly rated high on the standardization fuels on installation, ASTM D.02.01 carried out a programme in 1986 to verify the 1967 assigned octane values. This programme showed that some of the TSF assigned values appeared low and ASTM D.02 balloted new assigned values during 1987. Of the external members of ASTM D.02, only the Institute of Petroleum voted negative on these values and this was based on a single blend (the '74/26' blend) that had been coincidentally included in the IP Correlation Scheme during 1986. Although the IP vote was finally overruled, it was agreed to carry out a joint IP/ASTM programme during 1988-89 (19 laboratories from IP and 35 from ASTM), involving a wider selection of the TSF blends, together with stricter control and better recording of engine conditions. The results of this programme confirmed those of the ASTM 1986 programme and the IP then supported the ASTM position.

During 1989-90, European motor manufacturers, particularly in Germany, expressed serious disquiet about the implications of changing assigned TSF values on the measured octane number of finished motor gasolines and implied that such a change would require a change in specification limiting value for the motor gasolines then under specification development for Europe. Others, from a wider number of European countries, also voiced an opinion that the testing conditions in Europe were different from the United States and that the phenomenon of high qualification values was not a problem. At the same time as this discussion, the ISO test methods for octane number (5163 and 5164) were under review. This led to an uncomfortable position which culminated at the ISO/TC 28 meeting in Budapest in June 1990 when the weight of numbers of European members, excluding the

United Kingdom, on ISO/TC 28 prevailed and the ISO test methods (to be referenced in EN 228) were locked into the 1986 ASTM TSF values.

Thus, for the first time since engine testing began, there were two different standards applied, one of which was exclusive to Europe but masqueraded under the pseudonym 'international', whilst the standard used internationally outside Europe continued to be that of ASTM.

Consequent actions

A number of major commitments were given in Budapest in order to start to resolve this unsatisfactory situation. Firstly, all organisers of significant engine correlation programmes agreed to submit at least their previous year's data to a task force led by ASTM, for analysis and discussion at a special meeting in Phoenix in December 1990. Secondly, all ISO/TC 28 members agreed to participate and abide by the outcome, if this task force recommended actions.

The result of the Phoenix meeting was a recommendation to carry out a worldwide correlation programme of octane testing on TSF blends supplied from a single central source, under a number of specified engine conditions. This programme was finally designated TCD 93 (Toluene Calibration Data 1993), with blends supplied by Phillips 66 and distributed by the NEG (ASTM) Programme Manager.

The organisation of TCD 93 was complex, with samples being cascaded through 13 regional organisers to some 210 laboratories worldwide. Rather disappointingly, by the cut-off date of 14 January 1994, only 159 returns had been received. However, the data bank was massive and two task force meetings occurred in the United States in 1994 to set criteria and review the continuing analyses. Representatives of the United Kingdom (IP), France, Germany, Italy, Japan and China participated in these deliberations in varying degrees. The final conclusions were available early in 1995 and implemented almost immediately by ASTM for inclusion in the 1996 versions of ASTM D2699 and ASTM D2700.

Conclusions of TCD 93

The numerical results of TCD 93 essentially confirmed the conclusions of the 1986 ASTM and the 1988 ASTM/IP programmes in that the correct octane numbers to be assigned to a number of the TSF blends were historically low, albeit with one exception, by only a small margin (see **Table 1**).

The more disturbing outcome of TCD 93 was the discovery of the extent of malpractice in octane number testing, as a result of which over 40 percent of the received data were rejected. This malpractice occurred in engine parts, engine conditions and operational procedures and was not geographically distinct (except in one case). This has led to intense efforts to train a new generation of engine operators.

Actions following TCD 93

It should be realised that between 1990 and 1996, the ASTM test methods continued to be developed in areas other than TSF validation. Many other topics were addressed. In particular, the mechanism and degree of temperature tuning have been altered and clarified, alternative procedures have been investigated and adopted and the precision statements for both RON and MON have been updated and revised.

Parallel to the activity on TCD 93, a Task Force was rewriting ASTM D2699 and ASTM D2700 in a new format more closely aligned to an international style. These new-style methods were finally available as single copies from July last year. It is intended that abbrieviated versions of these documents are prepared as proposed versions of ISO 5163 and ISO 5164. These are scheduled to be available during the first half of this year.

At the CEN/TC 19 meeting in Rotterdam in May/June 1995, members were reminded of their commitment to TCD 93 and a resolution was passed urging all members to vote in favour of a revision to the ISO test methods incorporating the outcome of this programme.

Implications of TCD 93

It must be emphasised that the qualification of an engine as fit-for-use by means of TSF blends does not translate into an equivalent bias in measurement of octane number in a given engine. In the majority of cases, engines will qualify using either TSF value with no change in engine settings and this results in no change in observed results. The bracketing fuels used for the actual measurement have not changed. There will be a small change in population of qualified engines, while some

Blend composition % (v/v)				
Toluene	70	74	74	74
2,2,4-trimethylpentane	0	0	5	10
Heptane	30	26	21	16
TSF values				
RON (ASTM D2699)				
1966-86	89.5	93.4	96.7	99.6
1989	89.3	93.4	96.9	99.9
TCD 93 (1995)	NR	93.4	96.9	99.8
MON (ASTM D2700)				
1966-86	77.9	81.1	84.9	88.5
1989	78.0	81.6	85.3	88.8
TCD 93 (1995)	NR	81.5	85.2	88.7

Table 1: Toluene Standardization Fuels

Table 2: IP Correlation Scheme Results for 1995

	RON (ASTM D2699)			MON (ASTM D2700)		
TSF value	**1966-86**	**1989**	**Bias**	**1966-86**	**1989**	**Bias**
January	97.73	97.86	+0.13	86.37	86.85	+0.48
February	96.13	96.17	+0.04	85.63	85.89	+0.26
March	103.24	103.60	+0.36	92.32	92.19	–0.13
April	97.90	97.94	+0.04	87.02	87.22	+0.20
May	98.19	98.31	+0.12	87.43	87.64	+0.21
June	97.70	97.87	+0.17	86.92	86.94	+0.02
July	96.45	96.54	+0.09	85.40	85.68	+0.28
August	97.85	98.04	+0.19	86.75	87.13	+0.38
September	98.68	98.68	±0.00	87.54	87.76	+0.22
October	97.77	97.82	+0.05	86.94	87.16	+0.22
November	98.48	98.57	+0.09	87.23	87.41	+0.18
December	98.08	98.19	+0.11	86.86	87.18	+0.32

engines will need to be adjusted (tuned) to bring them towards the centre of the tolerance range of the new values. This may have a small effect on measured value.

Experience in the United States, where the change in TSF values was closely monitored in the market (although the market was not advised of any changes), showed no customer or manufacturer reaction. The conclusion given was that the vehicle engine is not seeing a distinguishable change in performance. There has been no adverse reaction from any other major market using ASTM test methods (Japan, Canada, Australia or South America). The only reaction has been from Europe, where the changes have not been implemented.

Table 2 gives the latest whole-year results from the IP Correlation Scheme on a month-by-month basis for 1995. This table needs to be interpreted carefully, as the TSF values given for 1989 are those generated in the 1988 ASTM/IP programme and not those of TCD 93. As will be noted from **Table 1**, the TCD 93 TSF data for MON actually reduced a consistent 0.1 from the 1988 figures and one RON figure also reduced by a similar amount. Any bias would therefore be magnified. Furthermore, since the IP Correlation Scheme is a mixed European/non-European population, the population of engines rating using the separate TSF values is not identical. Thus there is likely to be a magnification of the bias from this source also. **Table 2**, therefore, represents a worst-case scenario and practical values are likely to be much closer. Even if we take the values from **Table 2** as strictly comparable, the average bias is 0.13 RON (with one exceeding 0.2), and 0.22 MON (with three exceeding 0.3), which is significantly below the repeatability of the test methods given in **Table 3**.

The figures in **Table 3** are those in ASTM D2699-86 and ASTM D2700-86, ie those used as a basis for the generation of the 1988 and TCD 93 data and currently used in ISO 5163 and ISO 5164 implemented in Europe.

Octane number	RON (ASTM D2699)		MON (ASTM D2700)	
	Repeatability r	Reproducibility R	Repeatability r	Reproducibility R
80	N/A	1.2	N/A	1.2
85	N/A	0.9	0.3	0.9
90	0.2	0.7	0.3	1.1
95	0.2	0.6	N/A	1.1
99	N/A	N/A	N/A	1.5
100	N/A	0.7	N/A	N/A
105	N/A	1.1	N/A	1.8
110	N/A	2.3	N/A	N/A

Table 3: 1986 Test method precision values

Conclusion

The results of the worldwide TCD 93 programme to assign values to Toluene Standardization Fuels used in the generation of octane numbers for motor and aviation gasolines, show in general a small increase from those assigned in 1966-67. The bias in determined octane number is less than expected from repeat tests by a single operator on the same engine on the same fuel.

There is no evidence to suggest that engine and driver populations using fuels qualified by the new TSF values can distinguish any difference in engine performance from this change.

Recommendation

It is technically unacceptable to continue with two versions of the same test procedure for a property of automotive fuels that is recognised as internationally interchangeable, particularly since one version has received no upgrading maintenance for over 10 years.

Serious efforts should be made to prepare new versions of ISO5163 and ISO 5164 to reflect the outcome of TCD 93 and other upgrading activities implemented by ASTM D.02 since 1986, so that they can be fast-tracked for implementation in both ISO and CEN.

Publications

Today's Gas Glut and Yesterday's Contracts: The British Gas Predicament

Michael Stoppard (Oxford Institute for Energy Studies, 57 Woodstock Road, Oxford OX2 6FA) 85 pages. ISBN 0 948061 96 0. Price: £95 (paperback).

Deregulation of the gas and electricity industries has led to a state of pronounced oversupply in the UK gas market. As a result a market for the short-term trading of gas has emerged while delivery of some paid-for contract gas has been indefinitely postponed. The commissioning of the Interconnector in the fourth quarter of 1998 is expected to bring only partial relief to the market. This report analyses the past and current state of the UK gas market, focusing on British Gas which, while not the only company to be tied into unfavourable contracts, has the greatest exposure and greatest potential liabilities. Topics covered include a background to the emergence of competition in the UK gas market, the causes of oversupply, the significance of the spot market, analysis of supply and demand (including an assessment of British Gas' take-or-pay liabilities) and policy responses and possible outcomes.

Automotive Lubricants Reference Book

Arthur Caines and Roger Haycock (Mechanical Engineering Publications Limited, Northgate Avenue, Bury St Edmunds, Suffolk IP32 6BW) 706 pages. ISBN 1 86058 049 1. Price: £89.

Covering technological developments worldwide, this latest publiction from the Institution of Mechanical Engineers provides a thorough introduction to lubricant fundamentals and explains technical concepts in easy-to-understand language. In addition to discussing the relationship between test methods and formulation technology, the book also examines the blending, storage, purchase and use of lubricants. Health, safety and environmental issues are covered as well as specifications and oil approval systems.

A Guide to UK Oil and Gas Taxation

(KPMG, PO Box 695, 8 Salisbury Square, London EC4Y 8BB) 160 pages. ISBN 1 85061 241 2. Price: £15 (paperback).

This book is a general guide to UK oil and gas taxation as it affects producers, ancillary operators and individual employees. It explains the main features of the regime and identifies some of the problem areas likely to be encountered. Now in its ninth edition, the book is fully updated to reflect changes made by the 1996 Finance Act.

The Market and the Economics of Large Oil Tankers

Olivier Golomer (Oxford Institute for Energy Studies, 57 Woodstock Road, Oxford OX2 6FA) 159 pages. ISBN 0 948061 94 4. Price: £60 (paperback).

'When will the next peak in freight rates occur?' This is the question that most people involved in the tanker industry wish to have answered. Shipowners want to know whether investing capital in heavy repair costs would have any chance of producing a good return; charterers have to choose between time-charters and the spot market; shipyards need to adapt their slowly evolving capacity accordingly; and many others want to plan their activities to take advantage of opportunities to arise from a rise in rates. This study provides a general description of the VLCC (very large crude carriers of 200,000 tonnes or more) market, with particular emphasis on its function, the players involved and the formation of freight rates. It also examines the main features of a ship-owning company, details the costs and revenues involved in operations, assesses the implications of environmental pressures and summarises the numerous factors contributing to future cash flow. It concludes with a presentation of the decision-making process as a whole and the different approaches used in the industry and offers a description of the four main decisions that a shipowner may have to face.

Petrophysics: Theory and Practice of Measuring Reservoir Rock and Fluid Transport Properties

Djebbar Tiab and Erle C Donaldson (Gulf Publishing Company, PO Box 2608, Houston, Texas 77252-2608, USA) 706 pages. ISBN 0 88415 634 6. Price: $145.

This publication provides research and field engineers with the theories, mathematical concepts and methods for measuring and testing the properties of rocks and fluid flow. Designed for classroom use, each chapter includes examples and solutions. An appendix outlines laboratory experiments for the measurement of petrophysical fluid flow parameters, including discussions of equipment, procedures and calculations. A separate solutions manual, priced $20 or free to qualified instructors, contains answers to the problems.

Register of Offshore Units, Submersibles & Underwater Systems 1996-97

(Maritime Information Publishing Group, Lloyd's Register, 100 Leadenhall Street, London EC3A 3BP) 362 pages. ISBN 1 900839 00 8. Price: £153.

The latest edition of this reference book contains detailed information on mobile drilling rigs, submersibles, barges and platforms. The section on mobile drilling rigs provides data on the highly specialised purpose-built ships of the world's fleet including details of owners, builders, dimensions, equipment, facilities, rig shapes and capabilities. For submersibles, information on over 500 manned and unmanned craft gives details of diving bells, seabed chambers and compression chambers. Data on diving suits, communications and emergency systems are also included. A separate section relates to ships, barges and platforms used for pipe handling, heavy lifting, diving and submersible support, offshore dredging and construction, platform maintenance and accommodation.

Chemistry and Technology of Lubricants

Editors: R M Mortier and S T Orszulik (Blackie Academic & Professional, 2-6 Boundary Row, London SE1 8HN) 378 pages. ISBN 0 7514 0246 X. Price: £89.

Now in its second edition, this book provides a wealth of information concerning the underlying chemistry of lubricants. All the principal applications of lubricants are covered as are the base fluid types and various classes of additives. While the publication is aimed principally at those working in the lubricants industry or those in academia seeking a chemist's viewpoint of lubrication, it will also be of use to engineers and technologists who use lubricants and require a more fundamental understanding of the subject.

Standard Handbook of Petroleum & Natural Gas Engineering, Volumes 1 and 2

Editor: William C Lyons (Gulf Publishing Company, PO Box 2608, Houston, Texas 77252-2608, USA) Volume 1: 1,432 pages. ISBN 0 88415 642 7. Price: $275. Volume 2: 1,076 pages. ISBN 0 88415 643 5. Price: $220.

Formerly titled *Practical Petroleum Engineer's Handbook*, this updated, two-volume set has been expanded and revised to give petroleum engineers a comprehensive source of industry standards and engineering practices. Volume 1 examines the areas of mathematics, general engineering and science, and auxiliary equipment to provide a complete coverage of all aspects of drilling and well completion, while Volume 2 addresses reservoir engineering, production engineering and petroleum economics, including details of how to estimate oil and gas reserves.

Forthcoming Events

February

10th-11th
London: 'UK Gas Market'.
Details: IIR Ltd, 6th Floor, 29 Bressenden Place, London SW1E 5DR.
Tel: 0171 915 5055
Fax: 0171 915 5056

12th-13th
London: 'Knowledge Management in the Oil and Gas Industry'.
Details: First Conferences, 85 Clerkenwell Road, London EC1R 5AR.
Tel: 0171 404 7722
Fax: 0171 404 7733

13th-14th
Moscow: 'Oil & Gas Pipeline Projects in Russia & the CIS'.
Details: IBC UK Conferences Ltd, 57-61 Mortimer Street, London W1N 8JX.
Tel: 0171 453 2702
Fax: 0171 631 3214

17th
London: 'Financing the International Oil Industry — the Continuing Challenge'. Details: Pauline Ashby, The Institute of Petroleum.

18th
London: 'The 10th Oil Price Seminar: Managing the Short-term Risk'. Details: Pauline Ashby, The Institute of Petroleum.

18th-20th
Budapest: 'Benzinkút '97'.
Details: Miller Freeman BV, PO Box 200, 3600 AE Maarssen, The Netherlands.
Tel: +31 346 573 777
Fax: +31 346 573 811

19th-20th
Aberdeen: 'Scada Systems for the Oil & Gas Industry'.
Details: Energy Logistics International Ltd, Europower House, Lower Road, Cookham, Berkshire SL6 9EH.
Tel: 01628 525492
Fax: 01628 521928

19th-21st
Edinburgh: 'Advances in Reservoir Technology'.
Details: Anna Totten, IBC/PSTI.
Tel: 0171 637 4383

20th
London: 'Achieving competitiveness through Innovation and Value Engineering'. Details: Pauline Ashby, The Institute of Petroleum.

24th-25th
London: 'Worldwide Deepwater Technologies'.
Details: IBC UK Conferences – Energy Division.
Tel: 0171 637 4383
Fax: 0171 631 3214

24th-27th
Coventry: '1st Conference & Exhibition for the Construction & Operation of Underground Utilities'.
Details: Pipes & Pipelines International, PO Box 21, Beaconsfield, Buckinghamshire HP9 1NS.
Tel: 01494 675139
Fax: 01494 670155

25th
Aberdeen: 'The Global Challenge'.
Details: CRINE Secretariat, c/o Mobil Court, 3 Clements Inn, London WC2A 2EB.
Tel: 0171 412 4328
Fax: 0171 412 2071

25th
Coventry: 'New Substances: Bench-top to market place'.
Details: HSE, Room 204 Daniel House, Trinity Road, Bootle, Merseyside L20 3TW.
Tel: 0151 951 4595
Fax: 0151 951 4913

25th-27th
Islamabad: 'Pakistan Oil & Gas Summit '97'.
Details: First Conferences, 85 Clerkenwell Road, London EC1R 5AR.
Tel: 0171 404 0424
Fax: 0171 404 7733

26th
London: 'Application of Fluid Dynamics in the Safe Design of Topsides and Superstructures'.
Details: Conference Assistant, The Institute of Marine Engineers, 76 Mark Lane, London EC3R 7JN.
Tel: 0171 481 8493
Fax: 0171 488 1854

26th-27th
Vienna: 'Oil and Gas Pipelines in the Former Soviet Union'.
Details: Business Seminars International Ltd, Sussex House, High Street, Battle, East Sussex TN33 0AL.
Tel: 0171 490 3774
Fax: 01424 773334

26th-27th
North Warwickshire: 'National Conference 1997: Championing Best Practice'.
Details: Freight Transport Association, Hermes House, St John's Road, Tunbridge Wells, Kent TN4 9UZ.
Tel: 01892 552302
Fax: 01832 552333

26th-27th
Milan: 'Gasification Technology in Practice'.
Details: IChemE Conferences Department, 165-189 Railway Terrace, Rugby, Warwickshire CV21 3HQ.
Tel: 01788 578214
Fax: 01788 577182

26th-28th
Amsterdam: 'Offshore Pipeline Technology'.
Details: IBC Technical Services, Gilmoora House, 57-61 Mortimer Street, London W1N 8JX.
Tel: 0171 453 2712
Fax: 0171 453 2058

27th-28th
Madrid: 'The Future of Natural Gas in the Mediterranean'.
Details: IBC Financial Focus, 57-61 Mortimer Street, London W1N 8JX.
Tel: 0171 453 2703
Fax: 0171 323 4298

March

4th-5th
London: 'Corrosion, Inspection & Refurbishment of Bulk Liquid Storage Tanks.'
Details: IBC Technical Services Ltd, 57-61 Mortimer Street, London W1N 8JX.
Tel: 0171 453 2712
Fax: 0171 453 2058

4th-6th
Amsterdam: 'SPE/IADC Drilling Conference'.
Details: Society of Petroleum Engineers, 4 Mandeville Place, London W1M 5LA.
Fax: 0171 487 4229

5th-6th
Moreton-in-Marsh: 'Emergency Management Seminar: Processing, Handling and Transporting Dangerous Goods'.
Details: Ms Jenny Maisels
Tel: 01608 652156
Fax: 01608 651839

6th-7th
London: 'Opportunities for Investment in the Mediterranean Region'.
Details: The Conference Unit, The Royal Institute of International Affairs, Chatham House, 10 St James's Square, London SW1Y 4LE.
Tel: 0171 957 5700
Fax: 0171 321 2045

10th-13th
Amsterdam: 'Corrosion in the Oil & Gas Industry'.
Details: Mr Colin Britton
Tel/Fax: 01635 202329

13th-14th
London: 'Trade and Investment Opportunities in the Russian Oil Industry'.
Details: The Conference Unit, The Royal Institute of International Affairs, Chatham House, 10 St James's Square, London SW1Y 4LE.
Tel: 0171 957 5700
Fax: 0171 321 2045

People

Mr Vincent Richard has been appointed director of the Geophysics and Instrumentation Research Division of the Institut Français du Pétrole. He replaces **Mr Jean-Pierre Fail**, who is retiring.

Enterprise Oil has announced the retirement of **Mr John Gardiner** from the Board of Directors. Mr Gardiner retired on 31 December 1996 having served as a non-executive Director for the past 12 years.

Austrian oil and gas company OMV has announced that **Dr Heinrich Georg Stahl** has been appointed Chief Financial Officer responsible for Finance and Controlling and Chemicals. Dr Stahl succeeds **Dr Wolfgang Ruttenstorfer** who was appointed Member of the Executive Board responsible for Exploration and Production and Gas in December last year.

Mr John Faraguna has assumed the position of Vice President, Business Development at Western Atlas Logging Services. He will be based at the Western Atlas headquarters in Houston.

Mr Nick Willet has been appointed Marketing Manager for Alluvial Mining Ltd. Mr Willet will advise potential clients in the civil and offshore industries on the range of site investigation services. He joins the company from Fugro, where he was Operations Manager.

Ms Ranveig Froiland has been appointed Norway's new Minister for Petroleum and Energy, following the resignation of **Ms Grete Faremo**. An MP since 1985, Ms Froiland's most recent position was as Deputy Chairman of the Storting's Committee for Energy and the Environment.

UK oil and gas consultancy MAI has made three new appointments. *Mr Charles Lucas Clements* (above) joined the company as Business Development Director.
Ms Susan Whitbread, a Director at MAI for five years, will take on the role of Corporate Development Director.
Mr Alan Zenthon has been appointed Finance Director for the group.

Mr Nigel Walker has been appointed Marketing Manager of Hawke Cable Glands. He previously held a similar position at Wylex.

Raytheon Engineers & Constructors has named **Mr Paul J Riedl** as Vice President, European Sales. He is based at the company's office in The Hague.

Mr Bill Payne has joined PA's Management Group from the European Energy Practice of Andersen Consulting. **Mr David Hosein** has also joined PA's Energy & Chemicals Practice after more than seven years with Andersen Consulting's Strategic Services.

Mr Christopher G Moar has been appointed Company Secretary of Ramco Energy plc. Mr Moar is the Group Financial Controller and has been with the company for three and a half years.

Aberdeen Drilling Consultants Ltd has announced the appointment of **Dr Michael Gibson** as Well Engineering and Examinations Manager.

Scottish Power has appointed **Sir Peter Gregson** as a non-executive Director. Sir Peter was Permanent Secretary to the Department of Energy from 1985 to 1989 and Permanent Secretary to the Department of Trade and Industry until his retirement in June 1996.

Mr Ash Bakshi has been appointed Managing Director of Brown & Root Energy Services' Europe and Africa region. He assumes the responsibility for all of the company's business activities in the region. He also becomes Vice-President Brown & Root International Inc.

The Board of Administration of the Institut Français du Pétrole has appointed seven new members. They are: **Mr Franco Bernabé**, Managing Director and Chief Executive Officer of ENI; **Mr Jean-Martin Folz**, Manager of the Automobile Division of PSA Peugeot Citroën; **Mr Jean-Pierre Lamourre**, Chairman and Chief Executive Officer of Solétanche SA; **Mr Gérard Mégic**, Director of Institut Pierre-Simon Laplace; **Mr Gilbert Molto**, representing the Confédération

Mr Gary Sims has been appointed as Expro Group's Area Manager for the Southern North Sea. Mr Sims' most recent role was as Group Marketing Manager of the Testing & Environmental product line.

A former British Gas executive has been appointed Senior Vice President of PanCanadian Petroleum Ltd. *Mr Paul Ellis*, previously Director and General Manager of Hydrocarbon Resources Ltd, began his duties in January 1997 and has relocated to Calgary.

Français Démocratique du Travail; **Dr Rolf Stomberg**, Chief Executive Officer, BP Oil International and **Mr Daniel Valot**, Exploration-Production Manager of Total.

Mr James May has been appointed Director General of the UK Offshore Operators' Association (UKOOA) following the retirement of Dr Harold Hughes. Mr May is currently Director General of The British Retail Consortium, a position he has held for seven years. Dr Hughes will retire at the end of February.

The Rt. Hon. **Tim Eggar** has joined the Board of Monument Oil and Gas plc as a non-executive director. Mr Eggar, a Member of Parliament for Enfield North, has announced he will not be standing for re-election at the end of the government's term of office. He has been a minister since 1985, most recently as Minister for Energy. Last year he was appointed UK Chairman of oil service company, M.W. Kellogg. In the early 1980s he was a non-executive Director of Charterhouse Petroleum, run by present Chief Executive of Monument Oil and Gas, **Mr Tony Craven Walker**.

IP THE INSTITUTE OF PETROLEUM

Energy Economics Group

'Upbeat on the downstream'

Tuesday 25 March at 12.00 for 12.30 followed by a buffet lunch from 13.30 to 14.15

By Dr Rolf Stomberg, Managing Director, British Petroleum

IP contact: Jenny Sandrock

Have you moved?

If so, please could you inform the Membership Department.

IP THE INSTITUTE OF PETROLEUM

International Conference on

'The Safe Operation of Tankers in Coastal Waters and Approaching Terminals'

To be held at the Cavendish Conference Centre, London

Thursday and Friday 8-9 May

This international conference will follow the official publication of the UK Marine Accident Investigation Branch report into the *Sea Empress* accident and will review the lessons that have been learned from a sequence of casualties in coastal waters including the *Exxon Valdez, Braer, Borga* and *Sea Empress*. The papers, each given by a prominent specialist in his subject, will review the latest technical, operational and legal developments affecting the ability to operate large tankers safely in coastal waters.

For a copy of the programme and registration form, please contact:
Pauline Ashby,
The Institute of Petroleum,
61 New Cavendish Street,
London W1M 8AR
Tel: 0171 467 7100
Fax: 0171 255 1472

UK Deliveries into Consumption (tonnes)

Products	†Nov 1995	*Nov 1996	†Jan-Nov 1995	*Jan-Nov 1996	% Change
Naphtha/LDF	300,620	206,571	2,652,146	2,675,122	1
ATF – Kerosene	616,316	626,920	7,066,219	7,413,283	5
Petrol	1,979,759	1,958,550	20,110,225	20,433,593	2
of which unleaded	1,270,594	1,318,637	12,690,657	13,743,268	8
of which Super unleaded	84,605	56,930	881,352	654,159	-26
Premium unleaded	1,185,989	1,261,707	11,809,305	13,089,109	11
Burning Oil	264,825	333,404	2,384,355	2,917,286	22
Derv Fuel	1,352,979	1,340,940	12,474,185	13,274,645	7
Gas/Diesel Oil	643,510	682,505	6,628,451	6,990,770	6
Fuel Oil	737,023	539,068	7,365,510	6,244,118	-15
Lubricating Oil	81,117	72,220	832,274	801,706	-4
Other Products	753,311	700,834	8,278,652	8,004,835	-3
Total above	6,729,460	6,461,012	67,792,017	68,755,358	1
Refinery Consumption	555,871	566,303	5,890,007	6,022,992	2
Total all products	7,285,331	7,027,315	73,682,024	74,778,350	1

† Revised with adjustments *preliminary

Technology News

New fuel testing equipment aids compliance with new sulfur specifications

As of 1 October 1996, the maximum permitted level of sulfur in automotive diesel fuel in the European Union was reduced from 0.2 percent to 0.05 percent — a figure is likely to be further reduced to 0.035 percent in the future.

In a bid to aid compliance with these new sulfur norms, Philips Analytical X-Ray in the Netherlands has developed the Venus 100 Minilab.

Fully PC-controlled, the system operates in the Microsoft Windows™ environment and its users require minimal training.

Furthermore, as little sample preparation is required, the operator does not need to be a skilled analytical chemist. However, more experienced users can be given access to the built-in analytical programs for advanced data processing.

The system can also be used to measure a range of other environmentally important elements such as vanadium, nickel and lead at the levels required by a variety of fuel specifications.

Minilab

Lightweight compressor for offshore use

The new HP400 air compressor from Ingersoll-Rand has been developed for use in Zone II environments. The unit has a total weight of just 3,700 kg and is thus particularly suited to offshore applications where space and weight constraints are of paramount importance.

Because diesel engines are recognised as a potential source of ignition in hazardous areas, the compressor is equipped with a Pyroban flame protection system. The system uses air pressure to open the engine air inlet valve and fuel supply. Any conditions which would cause the engine to exceed pre-set limits — such as a high exhaust gas temperature, engine overspeed or coolant pressure loss — causes a collapse of the air pressure with simultaneous closure of the engine air inlet and fuel valves resulting in immediate shutdown of the compressor.

For added safety, the compressor is also equipped with a 'Yellow Alert' shutdown feature which is activated by any gas detection systems in the immediate vicinity. A manual shutdown system provides a final safeguard.

Drift-free temperature switch

Amot Controls has unveiled a rugged vibration resistant temperature sensing switch which requires no re-calibrating.

Developed to determine bearing temperature and monitor exhaust stacks and engine temperature and equipment in general, the 8258 Eutectic Temperature Switch has seven precision temperature ranges from 79°C to 173°C.

Temperature switch

Automatic fuel colour analysis

Tintometer's new Lovibond® PFX190/2 system automatically measures the colour of petroleum oils and fuels according to ASTM colour (as specified in ASTM D 1500) as well as the Platinum-Cobalt/Hazen Colour scale for light coloured oils and the Gardner Colour scale for petroleum derivatives. For research applications, colour can also be displayed in terms of internationally recognised CIE values and spectral data.

After initial selection of operating parameters, measurements are made with the press of a single key and take less than 30 seconds to complete. Data sets can be saved in the instrument, printed out or automatically downloaded to a PC for processing and analysis. A Windows software program is also supplied for generating spectral and CIE diagrams as well as detailed analysis of spectral data.

Colour analyser

Thermal mass flow meter for gases

Mass flow measurements offer higher intrinsic accuracy and better repeatability compared with traditional volumetric measurements. No temperature or pressure compensation is required.

Furthermore, thermal mass meters contain almost no moving parts and are virtually maintenance free.

A new thermal mass flow meter for gases is now available from Flotech Solutions.

The Series 5700 offers a basic accuracy of ±5 percent fsd with a repeatability of 0.5 percent fsd. The meter has been designed for applications such as leak detection and gas analysis, burner feed systems, purge gas and particle monitoring.

The unit uses a heating element in the gas stream in between two temperature sensors. As gas flow increases the temperature differential increases.

An electronic feedback system applies power to the heating elements to maintain the temperature differential and the gas flow rate is proportional to applied power.

Thermal mass flow meter

Technology News

Interactive reference data on CD-ROM

A new interactive CD-ROM digital atlas of East and South East Asia has been unveiled by Cambrian Consultants.

Compiled on behalf of CCOP members (an intergovernmental organisation for the promotion and coordination of geoscientific programmes in offshore and coastal areas in East Asia) the CD-ROM combines cultural information with a detailed 'play atlas' featuring geologic, stratigraphic and hydrocarbon occurrence information for specific basins and over 20 maps describing three main sedimentary units, broadly based on regional disconformities, with respect to thickness, lithology and depositional environment.

The data is packaged with a GIS viewing and plotting tool to improve accessibility.

The company is also soon to release the UKOOA/BGS publication *Lithostratigraphic Nomenclature of the North Sea* in an interactive electronic form. Containing many examples of reference wells and regional correlation panels, the reference book has previously been published in seven A3-sized volumes.

Secure networking over the Internet

IBM has launched a new network-based global information delivery service that allows petroleum industry personnel to collaborate and conduct business securely over the Internet.

PetroConnect can be accessed from more than 830 local dial numbers in nearly 50 countries. It provides the user with access to many digital databases including maps, surveys, well logs and seismic data using a geographic navigator as well as access to research reports, statistical findings and industry standards. The system also facilitates collaboration with project team members via messaging and workgroup functions.

Agile control of ROV manipulators

A portable version of UK Robotics' Advanced Teleoperated Controller (ATC) is now available. Designed for the oil and gas industry where remotely operated vehicles (ROVs) are required to work in the most testing of conditions, the new Agile system is splashproof and weighs less than 10 kg.

ROV manipulator movements, be they straight line or curved, are controlled by a pair of joysticks and a series of simple buttons for different functions. The system can be tailored to meet specific customer needs and is fully upgradable and compatible with ATC.

Features include an immediate freeze facility which locks the ROV manipulator in place and allows the operator to concentrate on 'flying' the unit as well as intelligent access locking or resolved motion which locks some of the axes in certain locations with certain movements to simplify overall control of the unit.

According to the manufacturer, the Agile unit's functionality approaches that of the full-size ATC system and is capable of carrying out a range of complex tasks such as opening valves and detailed inspection work.

ROV control system

Sample-free flow viscosity measurement

A dynamic viscosity measurement system requiring no need for sampling has been developed by Fisher-Rosemount. Designed for quality control applications such as those found in oil and chemicals production, the system is based on the company's Micro Motion Coriolis instrumentation.

Under flow conditions, a real-time viscosity measurement, accurate to 1-2 percent, is mathematically derived from dynamic mass flow, density and temperature measurements taken by a mass flow meter installed in-line, while a differential pressure transmitter across its pipe connections also records pressure data. The viscosity measurement is provided in absolute or kinetic units.

Mass flow meter

Level switches give liquid security

Alan Cobham Engineering has developed a range of liquid level switches which are manually checkable for the safe handling and security of liquids. Available in float and displacer formats, the switches are designed for both direct contact and floating roof detection in oil, fuels and other liquid chemicals across all viscosities.

Liquid level switch

The manual test facility simulates the extremes of both high and low level in a tank by directly actuating the float or displacer.

The stainless steel switches are fully lockable to prevent misuse. Increased flameproof approved or intrinsically safe models are also available.

Reduced leak risk instrument manifold

Instrument manifolds have traditionally featured female ends requiring two separate male connectors, PTFE tape or anaerobic sealant and perhaps lubricants to guard against galling, in order to connect with tubing. Such an arrangement provides a potential leak path.

A new range of three-way, direct-mount instrumentation manifolds with integral tubing connections has been developed by Parker Hannifin in a bid to reduce significantly both this potential leakage and assembly time, while eliminating the need for sealants or lubricants.

The F3RP manifold design is available with single- or twin-ferrule compression fittings integrated into the manifold body which can be manufactured from stainless or carbon steel, Monel, 6Mo, Hastelloy or a number of corrosion-resistant exotic materials. Valves with Viton packing and Delrin seats are offered as standard, although users can specify a range of other materials for a wide range of temperature and media compatibility.

Despite the valve's very high pressure rating, up to 690 bar, it requires a typical closing torque of just 5.5 Nm.

The integrated manifolds also enable more compact instrumentation systems.

Technology News

Portable infrared gas analyser

The new Miran SapplRe series of portable infrared gas analysers from Quantitech is menu-driven and provides user-friendly prompts to guide the user through every step of set-up and operation.

Quantitative single gas monitors to simultaneous five component analysers with onboard data logging are available, with the battery providing up to six hours of operation when in portable mode. The variable path-length, multipass gas cell and scanning filter provide per-cent, ppm and ppb detection of almost all organic and many inorganic gases while an optional high performance detector offers a three-fold improvement in sensitivity.

All models are upgrade-able to higher specification without hardware changes.

Portable gas analyser

Pipeline and pressure vessel closures

GD Engineering has developed a range of Boltlock low-pressure bolted closures that allow quick access to process vessels and pipelines. Available in diameters from 6 to 48 inches and operating at temperatures up to 450°F, the closures are said to be a lower cost, lighter weight option compared with the more conventional blind flange combination.

The closures have a 2:1 ellipsoidal cap hinged to a welding hub. High strength cad-plated eye bolts, pinned to lugs on the hub, swing clear of the cap after the nuts are loosened. An eye-bolt or camlock version is also available for faster operation without separate tooling. An 'O' ring located in the cap provides positive sealing between the cap and hub.

For added safety the holding lugs are mounted on the closure head at an angle of 10°. This requires the bolts to be slackened off an extra turn before they will swing out of the holding position.

Water quality monitoring

Montec International has added a new range of single and multi-parameter water quality monitors to its instrumentation portfolio.

The Series 5000 monitors key determinants such as pH, conductivity, turbidity, dissolved oxygen and specific ions. Based on a standard microprocessor controlled monitor, the units can be configured to match all quality monitoring applications by simply changing the sensor and software.

The monitors are suitable for a number of industrial measurement and control applications. The multi-parameter unit is capable of measuring up to four parameters at any one time.

Available with either dip probes for direct immersion in the sample or as an on-line flow through system for continuous quality measurement, the units can be fully integrated with a sampler and datalogger in order to create a complete monitoring system.

Water quality monitor

Well target analysis database

As part of the UK Department of Trade and Industry data release programme, Asset Databases has launched the Well Target Analysis Database.

Containing target, geological and test information for over 2,400 released exploration and appraisal wells on the UKCS the database enables the user to identify well targets and rapidly generate success rates by stratigraphic horizon for any area. Discovery volumes can be easily tracked through time.

The database also contains failure causes for unsuccessful wells and lists four categories of potential untested hydrocarbon column. It can be updated to include non-released wells on a proprietary basis.

Contacts

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Flotech Solutions	0345 776356
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Alan Cobham Engineering	01258 451441
Parker Hannifin	01271 22591
Quantitech	01908 227722
GD Engineering	01909 482323
Montec International	0161 872 1487
Asset Databases	01224 585009

Institute News

NEW MEMBERS

Mr R A Acason, Ocean Shipping Consultants
Mr A A A Anawi, Sunfine Limited
Mr M Bingham, Falklands Conservation
Mr T P Blake, FIDC
Mr E Bradfield, WEFA Limited
Mr J M Brake, GATX Terminals Limited
Mr P G Chapman, Brentwood
Mr R N Clacher, London
Mr S Dawood, Al Ahram Transport Company LLC
Mr I Dempster, Falkland Island Development Corp
Mr H Dingwall, Scottish Enterprise Operations
Mr N Edwards, Fife Council
Mr C P Gebhard, Eastern Energy Management Limited
Mr S Ghosh, SGI Enterprises Limited
Mr R Gill, Aberdeen
Mr E Gittins, Preston
Mr K C Godfrey, Ayrshire
Mr D P Gorsuch, Tunbridge
Mr S Graham, Graham Science Associates
Mr D Hegarty, HSBC Investment Bank
Mr M H Hemming, Wolverhampton
Mr M D Holmes, Kuwait Petroleum (GB) Limited
Mr N A Hopkin, Middlesbrough
Mr D A Hughes, Hughes Offshore Group Limited
Mr A P Hunt, Radlett
Mr R J Hunter, IBCA
Mr C P Jewell, Camberley
Miss H Jones, QuantiSci
Mr S M Leeson, Newbury
Mr P R Lehmann, Philcann (Australia)
Mr M M M Lok, Hong Kong,
Mr W J Luesley, St Osyth
Captain S M A Mahmoodi, M International Services (PVT) Limited
Mr P A McLellan, Orkney
Mr R P Mills, Aberdeen
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Mr S S Robinson, Linde Gas UK Limited
Mr S Room, Morgan Bruce
Mr A Shehu, Middlesex
Mr M C Smith, IBM
Mr N G M Smith, Richard Mozley Limited
Mr S L Stevens, Devon
Mr A Stewart, London
Mr J F Straitz III , NAO Inc
Mr D A Thomas, Red Group
Mr S I Togun, Fina plc
Mr I Ustamusic, Rasco Oil and Gas Processing Company
Mr P Varghese, Mobil Oil
Mr M M Watson, UK Petroleum Industry Association
Miss E A West, Simmons & Simmons
Mr C M Weyer, Switzerland
Mr N Wheeler, P & I Services
Mr G T Wight, Thailand
Mr S Williams, Steve Williams-Tech Support Limited
Mr K T Williams, Mobil North Sea Limited
Mr J R Wylie, Monarch Exploration (Falklands) Limited
Mr D J Young, Inchcape Testing Services UK Limited

STUDENTS

Mr S Abdullahi, Dundee
Mr A A Ajibade, Dundee
Mr R Hammer, Aberdeen
Miss M B Naranjo, Ecuador
Miss S M Parker, Cardiff
Miss Y-L Sim, Hendon
Mr E Trase, Aberdeen

IP Individual Membership Survey

The initial findings of the completed IP Individual Membership Survey were presented to IP staff in late January. Questionnaires had been sent out to all individual members last autumn, asking detailed questions relating to membership, use of IP services, branch attendance as well as *Petroleum Review* and other publications.

The response rate was a high 30 percent, yielding 'a very, very good set of data,' according to Dr David Prince of Prince Research Consultants Ltd who ran the survey on behalf of the Institute. The survey's figures corresponded closely to information held on the Institute's own membership database.

'Report of Findings of Individual Membership Survey', prepared by Dr Prince, is available for study in the IP Library. Detailed analysis of the facts, figures and findings is currently being undertaken and will be reported in the April issue of *Petroleum Review*.

AROUND THE BRANCHES

Shetland
20 February: AGM with talk by Ian Kinniburgh of Shetland Islands Council on proposed waste/heat project

Aberdeen
11 February: AGM

Yorkshire
11 February: AGM followed by Hot Pot supper

Essex
12 February: AGM followed by *Vapour recovery from terminal to service station*, Paul Chawner, Purfleet Commercials Ltd

Edinburgh & SE Scotland
13 February: *Energy efficiency best practices in refining & petrochemical industries.* Speaker from Dept. of Environment. AGM

Northern
18 February: *Victuals for the prancing horse – Shell/Ferrari motor racing,* Mr R Lindsay

London
18 February: *Transport for the Millennium,* Richard Turner, Freight Transport Association and Stephen Joseph, Transport 2000

Midlands
19 February: AGM

Stanlow
20 February: Evening tour of Chester Cathedral

East Anglia
20 February: AGM followed by tour of Tolly Cobbold Brewery, Ipswich

Humber
20 February: *Hydro skimming, refinery front end processing,* Mr R Brown

South Wales
21 February: AGM followed by Grandad movies, John Haggar

PETRONAS
CARIGALI

We are a subsidiary of PETRONAS, the Malaysian National Oil Corporation, involved in the Exploration and Production business. In line with our business expansion programme, we would like to invite suitably qualified and experienced candidates for employment on contract basis in various Technology Custodian positions in our domestic and international operations. These positions are :-

A) Technology Custodian - Geophysics

- Provide in-depth technical support and advice on petroleum geophysics;
- Be the medium for access to the latest state-of-the-art technology with regard to the geophysical data acquisitions, processing and interpretation as well as an intimate "hands-on " experience and in-depth knowledge of the problems associated with specialised seismic attributes studies (e.g. AVO, inversion, VSP etc.) on petroleum systems and basin analysis;
- Must have extensive experience in carrying out integrated studies, incorporating all aspects of exploration/development geophysics and petroleum geology to assess hydrocarbon prospectivity and minimise uncertainties in hydrocarbon resource determination especially in complex and diverse hydrocarbon systems.

B) Technology Custodian - Geology

- Provide in-depth technical support and advice on petroleum geology;
- Be the medium for access to the latest state-of-the-art technology with regard to geochemistry, sedimentology, structural geology, sequence stratigraphy and basin analysis as well as an intimate "hands-on" experience and in-depth knowledge of the problems associated with specialised geological studies in determining most prospective areas for exploration world-wide;
- Must have extensive experience in carrying out integrated studies, incorporating all aspects of exploration/development geophysics and petroleum geology to assess hydrocarbon prospectivity and minimise uncertainties in hydrocarbon resource determination especially in complex and diverse hydrocarbon systems.

C) Technology Custodian - Drilling

- Be a resource person with in-depth knowledge and expertise in the field of well construction.
- Be the medium for access to the latest state-of-the-art technology with regard to well construction engineering, covering all the latest theoretical design and analysis methods as well as practical knowledge of the problems associated with the drilling, completion, workover and abandonment activities. To also include knowledge on the methods of providing cost-effective means to execute the various projects.
- Be the person to train and develop drilling engineers to specialists in this field.

D) Technology Custodian - Petrophysics

- Provide a centre of know-how for petrophysics in its widest sense.
- Provide in-depth technical support and advice on all matters related to petrophysics.
- Serve as medium for access to the state-of-the-art technology with regard to the principles and practices of petrophysics.
- Have extensive experience in integrated reservoir studies, field development planning and reservoir management.
- Plan projects, guide, motivate, train and develop both senior and junior petrophysicists to specialist levels in formation evaluation.

E) Technology Custodian - Reservoir Engineering

- Provide in-depth technical support and advice on petroleum reservoir engineering.
- Serve as medium for access to the state-of-the-art technology with regard to reservoir engineering principles and practices, including improved oil recovery.
- Have extensive experience in integrated reservoir studies, field development planning and reservoir management, including risk quantification and management of uncertainty.
- Can plan projects, guide, motivate, train and develop both senior and junior reservoir engineers to specialist levels in reservoir engineering.

F) Technology Custodian - Production Technology

- Provide in-depth technical support and advice on production technology.
- Serve as medium for access to the state-of-the-art technology with regard to petroleum production technology principles and practices.
- Have extensive experience in integrated reservoir studies, field development planning and reservoir management.
- Can plan projects, guide, motivate, train and develop both senior and junior production technologists to specialist levels.

G) Technology Custodian - Rotating Machinery

- Provide in-depth technical support and advice on all engineering matters concerning the design, selection and maintenance of rotating machinery.
- Be an expert in factory testing and field installation aspects.
- Have knowledge and experience to quickly identify cause of equipment failures in existing equipment fleet.
- Be the person to guide, motivate, train and develop junior rotating machinery engineers to become specialists in this field.

H) Technology Custodian - Offshore Structures

- Provide in-depth technical support and advice on all engineering matters concerning design, fabrication and installation including the technical soundness, planning and costs.
- Be the medium for access to the latest state-of-art technology with regard to offshore structures, covering both all the latest design and analysis methods as well as having an intimate 'hands-on' knowledge of the problems associated with fabrication and installation of these structures.
- Experience in the design and installation of pile foundations and other methods of providing cost-effective foundation means for structures.
- Well-versed with state-of-the art structural analyses methods such as push-over (plastic collapse), finite element, spectral fatigue, fracture mechanics, and other techniques such as structural reliability to assess the structural integrity of existing old platforms for meeting "fitness for purpose" criteria.
- Be the person to guide, motivate, train and develop both senior and junior structural engineers to become specialists in this field.

Qualifications and experience

- University graduate (preferably with a MSc or PhD) with a minimum of 20 years in the E&P business of which 18 years should be in the specific area of expertise.
- Should have an in-depth knowledge in this area of specialisation and be considered as an expert or authority in this field.
- Should be very familiar with the state-of-the-art technology in this field on a world-wide basis.
- Should have published and presented technical papers in professional magazines/journals and at various conferences/- seminars.
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50776 KUALA LUMPUR
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Please indicate the position applied for on the top left-hand corner of the envelope.

All applications will be treated in the strictest confidence.
Only shortlisted candidates will be notified.

Application could also be sent (without the photograph) through the email to hairi@petronas.com.my

*****

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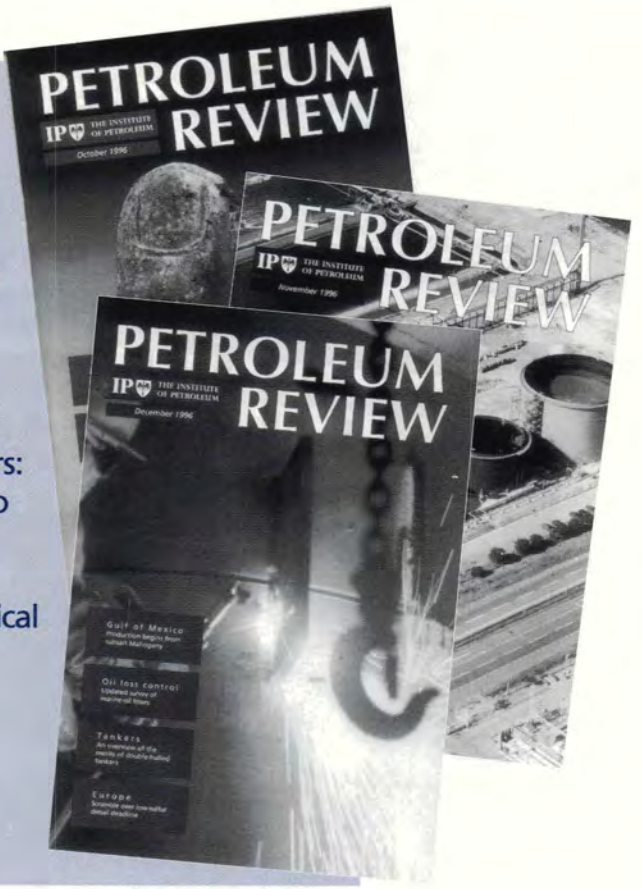

UK RETAIL MARKETING SURVEY

This comprehensive annual survey of the forecourt retailing business is published annually in March. The wide-ranging and in-depth analysis draws directly from company sources and examines retail trends, sector performance and developing market opportunities.

Over the years, this document has proved to be the industry bible for everyone who is involved in the marketing of fuels in the United Kingdom.

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