

PETROLEUM REVIEW

IP  **THE INSTITUTE
OF PETROLEUM**

November 1996

Canada

Improving prospects for
tar sands

Gulf of Mexico

Innovative production
spar on Neptune field

Seismic surveying

Vertical cable seismic
brings results

Flare emissions

New system for remote
monitoring

IFEG

Towards the Millennium — an overview of new developments in the upstream oil industry

Thursday 14 November

In the North Sea, the days of giant new oil discoveries and limitless development budgets have gone for good. The slimmed down oil industry of the next millennium will look quite different from that of a quarter of a century ago. It can be difficult for people working in a single segment of the industry to gain an overall insight into the changes that are proceeding so rapidly.

The IFEG autumn conference will present an overview of some of these key transitional features:

- the CRINE initiative
- data management for ETAP
- partnering and alliancing
- decommissioning
- goal-setting regulation
- emerging technology in the Schiehallion project.

The day will be useful for information specialists, engineers, managers and relatively new entrants to the industry.

For further information please contact:

*Pauline Ashby, The Institute of Petroleum, 61 New Cavendish Street, London W1M 8AR UK
Tel: 0171 467 7100 Fax: 0171 255 1472*



Petroleum Measurement Manual Part X: Meter Proving

Section 7: Calibration of Reference Meter Used for Gantry Meter Proving. Sub-Section 7.1: Small Volume Prover Method

Loading gantry meters provide the principal form of measurement for deliveries of petroleum fuels from terminals to service stations. It is therefore essential that these meters are accurate and that they are regularly proved using techniques that provide the highest attainable accuracy.

Reference meters are widely used as transfer standards to prove gantry meters. It is, in turn, essential that they are calibrated to the highest standard. The traditional method uses a volumetric vessel with the particular grade of product and is usually carried out in a flow laboratory. Small volume provers (SVPs) provide a closed system method of reference meter calibration that may be used in the field. They offer the advantages that comparatively small volumes of product are used in the operation and the products employed are the actual grades metered by the gantry meters. This minimises measurement uncertainty associated with the use of different viscosity test liquids.

The standard has been specifically developed for the application of SVPs to the calibration of reference meters employed to prove gantry meters. It describes in detail the selection and calibration of equipment and the precise, operational procedures and calculation routines that are recommended when performing such operations. Adherence to these procedures will assist in achieving a high standard of measurement accuracy and traceability in gantry meter proving.

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EDITORIAL

Editor: Carol Reader
Deputy Editor: Kim Jackson
Production Editor: Emma Parsons
61 New Cavendish Street, London W1M 8AR
Telephone: (0171) 467 7100
Fax: (0171) 255 1472

ADVERTISING

Alison James
Anne Marie Fox
Classified: Elaine Smith
Landmark Publishing Services
8 Garrick Street
London
WC2 9BH
Tel: 0171 240 4700
Fax: 0171 240 4771

PUBLISHERS

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Director General: Ian Ward

61 New Cavendish Street, London W1M 8AR
Telephone: (0171) 467 7100
Fax: (0171) 255 1472



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For details of subscriptions, please apply to Anne Poynter
at the Institute of Petroleum
Tel: 0171 467 7124

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COVER PHOTO

Waste water treatment unit at Humber
refinery. Photo courtesy of Conoco

News in Brief

4 September

Exxon and Shell are to form a Polish limited liability company to conduct oil and gas exploration and production activities in central Poland. The new venture will trade under the name Polish Petroleum Development Company.

19 September

Elf Oil UK and Murco Petroleum report that the £70m hydrodesulfurisation unit has started up at their Milford Haven refinery. The new unit reduces the level of sulfur in diesel to 0.05 percent in line with new EC environmental regulations.

Chernomorneftegaz of the Ukraine and Shell plan to set up a joint venture by 1997 to explore oil reserves on the Black Sea shelf.

Mobil Exploration and Development Argentina has purchased a 28 percent interest in the Sierra Chata gas field and Chihuidos block in the Neuquen Basin of Argentina from BHP Petroleum for an undisclosed sum. The sale is known to include a cash payment and interests in certain Gulf of Mexico offshore blocks, including the Ewing Bank 990/946 and Green Canyon blocks 58, 60, 152 and 153.

Arco has signed a summary shareholders agreement and detailed financing terms with Lukoil for their Lukarco joint venture, which was formed to invest in upstream oil and gas opportunities in Russia and other countries. Arco, which has a 54 percent interest in the venture, will provide most of the \$5bn funding over an 18-year period.

20 September

Chevron has sold its wholly owned subsidiary Sumatra Gulf Oil Limited to Premier Oil. The company will divest its two-thirds interest in the Natuna Sea block 'A' production sharing contract offshore Indonesia as part of the sale.

United Meridian Corporation and Shell Exploration Africa have signed a production sharing contract with the government of Côte d'Ivoire for the country's first deepwater offshore block.

21 September

Mobil and PdVSA are to produce extra-heavy crude oil in the Orinoco Belt under a joint venture, according to *Lloyd's List*. The venture will also upgrade the crude oil in Venezuela, while final processing will be carried out at Mobil's Chalmette refinery in Louisiana.

23 September

Edinburgh Oil & Gas is to acquire DSM Energy's 10 percent interest in seven UK onshore licences, a move which boosts its oil and gas reserves by some 15 percent. The gas fields are located north of Malton in North Yorkshire.

Ameron International has acquired the worldwide Devco marine coatings business, as well as industrial maintenance markets in Europe, the Middle East and parts of Africa, making it the largest supplier of high performance marine and offshore coatings in the United States.

Theodore Vardinoyannis, Vice President of the Vardinoyannis oil and shipping group's Motor Oil company, has died after a heart attack.

24 September

Chevron Chemical Company and Saudi Industrial Venture Capital Group have formed a 50:50 joint venture company, Saudi Chevron Petrochemical, to build and operate a \$650m petrochemical complex in Al-Jubail in Saudi Arabia.

The UK Department of Trade and Industry has given Conoco, British-Borneo Oil & Gas and Lasmio North Sea consent to develop the Boulton field in the southern North Sea. Scheduled to enter production during the second

quarter of 1998, the field has recoverable reserves of some 165 bn cuf of wet gas. Production from the field's not-normally-manned platform is expected to peak at 90 mncuf/d.

Proteus Petroleum has taken over UK wholesale diesel distribution company Silwood Petroleum.

British Petroleum has signed a memorandum of understanding with state-owned ENH-Hidrocarbonatos de Macambique granting the former exclusive rights to explore in Mozambique's Zambesi Delta, reports *Reuters*.

25 September

Pogo Producing Company has won two tracts — Galveston blocks 240 and 284 — in the federal oil and gas lease sale covering areas on the western part of the outer continental shelf offshore the Texas coastline.

Greenpeace has announced that it supports 21 out of 29 of the proposals being considered by Shell for disposing of the *Brent Spar*. It has an 'in-principle objection' to only one option, involving the disposal of the structure at sea. A further seven options were deemed 'too unclear' for support or comment.

Canadian company Black Sea Energy has completed the necessary agreements to form a joint venture giving it a 50 percent interest in the rehabilitation of the Anastasievsko-Troitskoye oilfield in southern Russia, reports *Lloyd's List*.

Shell Petroleum Development Company of Nigeria Limited (Eastern Division) has awarded conceptual design work to ABB Lummus Global under an existing contract for associated gas gathering supply to the Aluminium Smelter Company of Nigeria Limited. The project aims to utilise associated gas from nine flow stations in the Alakiri and Obigbo North areas and reduce gas flaring.

British Petroleum has found that the leak in Foinaven's manifold was caused by an over-effective cathodic protection system and stresses induced during the manufacturing process.

26 September

Global Marine Integrated Services is to undertake all drilling for British Gas Exploration and Production on the UK Continental Shelf for the next three to five years.

StatOil and the China

National Offshore Oil Corporation have jointly contracted with Lufeng Development Company to lease a production ship for the Lufeng 22-1 oilfield in the South China Sea. The NOK600m contract runs for two years with opportunities for extensions as long as the field remains onstream.

30 September

Esso Norge Exploration and Production has entered a letter of intent with Simon Møkster Shipping for hire of a multipurpose vessel for the Balder field.

Stolt Comex Seaway has secured a \$20m contract for the installation of flexible risers, umbilicals and a submerged turret production buoy and associated mooring system on the Lufeng 22-1 field in the South China Sea.

1 October

Official gas deliveries have begun from the Troll field under gas sales agreements with customers in six European countries. Deliveries of more than 1,000 bn cum of gas over a period of some 20 years are forecast (see *Petroleum Review*, September 1996).

Norsk Hydro has awarded a NOK270m contract to Saipem UK for the transport and offshore installation of the jacket and deck for the Oseberg East field platform to be located in block 30/6 of the North Sea.

News in Brief

Simon Storage's Immingham

West Terminal has been awarded the Royal Society for the Prevention of Accidents Gold Award for the second year running.

2 October

First gas production from the Schooner field in the southern North Sea has flowed on schedule. The field has estimated gas reserves of approximately 600 mncuft and will produce initially at an average of 130 mncuft/d and 170 mncuft/d at peak.

Australia's WMC mining group is to sell its Thevenard oil assets, including 10 percent stakes in the Roller/Skate and Saladin oilfields off the coast of Western Australia, to a subsidiary of Shell, reports the *Financial Times*.

Emerald Energy is to spend \$3m drilling a three billion barrel oil target to earn 60 percent of the Apulo Block in Colombia.

Kazakhstan's industrial heartland has shut down as local power stations failed to keep up has demand after Russia cut off electricity supplies to the power grid in the north of the region in a bid to enforce payment of debts, reports the *Financial Times*.

Butler Fuels has launched 'Butler Assist', a 24-hour, seven-days-a-week SOS service for its domestic oil customers.

3 October

The Coparex Group has acquired a major share of Samedan of Tunisia Inc's oil and gas assets in Tunisia, including the offshore concessions of Birs, Oudna and Isis and the exploration licence of Cap Bon Marin as well as the onshore concession of Zinnia.

Dana Petroleum has completed the drilling of two further oil production wells on its South Vat-Yoganskoye oilfield in West Siberia.

Amec Process and Energy has been awarded a five-year

integrated services contract for Shell Expro's gas supply operations in the southern North Sea, including the Bacton natural gas terminal in Norfolk.

Yukos, Russia's second largest oil company, plans to take a 10 percent stake in Lithuania's Klaipėdos Nafta oil terminal and to ship between two to three million tonnes of oil through it annually, according to *Reuters*.

5 October

First oil has flowed from the Anasuria floating production, storage and offloading vessel eight weeks ahead of schedule. Oil production from the Teal, Teal South and Guillemot A fields in the North Sea is forecast to build to a peak of 60,000 b/d by the end of the year.

7 October

Gazprom is to offer just over one percent of its shares to international investors at a price almost four times that of its domestically traded shares which are offered at around 40 cents each, reports the *Financial Times*.

Energy Africa and Petro-Inett Corporation have entered into a production sharing agreement with Sonangol UEE, the Angolan national oil company, to explore for and develop potential hydrocarbons on block 7 offshore Angola.

Elf Aquitaine has sold its entire 2.9 percent holding in the Compagnie Financière de Suez to Electralfina, a subsidiary of Belgian company Groupe Bruxelles Lambert as part of the oil company's drive to reduce its financial interests.

Lex Transfleet has launched its own fuel card offering savings of up to 5 pence per litre when compared with normal pump prices. The cards have an assistance freephone number and can be used at around 800 key fuels HGV sites.

8 October

The UK government has given the go-ahead for development of the West Brae field located in block 16/7a in the central North Sea. The field will be a subsea development tied back to the Marathon-operated Brae 'A' platform. Reserves are estimated at 30m gross barrels of oil. First oil is planned for late next year.

PT Caltex Pacific Indonesia has acquired a new production sharing contract for the Sibolga block off the northwest coast of Sumatra.

The New York Mercantile Exchange (Nymex) reports that the possibility of including crude deliveries from BP's Cusiana field in Colombia is under discussion.

McDermott Marine Construction has secured a £30m EPIC contract for the subsea element of the West Brae field development.

10 October

A Japan National Oil Corporation, Canada Petroleum International and Ecopetrol joint venture has been awarded concessions for oil exploration and production in the Tocaragua block and Troyano fields in Colombia, reports *Lloyd's List*.

Chevron has announced a new discovery of crude oil in the Huizhou area in tract 16/08 in the Pearl River Mouth Basin of the South China Sea.

11 October

Amoco and Honeywell have established a business alliance to provide automation solutions for Amoco's facilities worldwide.

14 October

Paktank Corporation has acquired a 51 percent interest in Wilmington Liquid Bulk Terminals Inc. Based at the Port of Long Beach in California, the 2.4 million barrels capacity terminal handles a range of petroleum and chemical products.

Nederlandse Aardolie

Maatschappij has discovered a promising gas find in the Waddenzee, according to *Lloyd's List*.

Bula Resources reports that development well number 705 on the Salymskoye oilfield in western Siberia has successfully tested at a rate of 942b/d. The field is estimated to contain 585 million barrels of proven and probable recoverable oil reserves. Bula hopes to start production shortly.

Simon Management has expanded its current pipeline operation and maintenance contract with Kinebica to incorporate new links supplying combined heat and power facilities at both Lindsey and Humber oil refineries at Immingham.

Smit Internationale NV is to sell its offshore supply vessel assets and certain offshore supply related joint venture interests to Seacor Holdings in the United States.

15 October

Oil Limited reports that it has achieved International Safety Management (ISM) Code accreditation for its 11-strong fleet of North Sea offshore support vessels some six years ahead of the date set for mandatory implementation of the Code.

16 October

Mobil Oil Corporation, Ramco Energy and Total Exploration and Production have signed an agreement to evaluate oil and gas exploration and production opportunities in an area within the Azerbaijan Republic. The consortium, to be known as MRT Energy, will be 40 percent owned by Mobil, 20 percent by Ramco and 40 percent by Total.

18 October

Participants in Australia's North West Shelf LNG project have submitted a \$5bn expansion plan to the eight Japanese power and gas utility customers who purchase the LNG which would almost double existing sales capacity to some 14.5 million tonnes per year. The expansion could be on stream by 2003.

Joint industry project looks at future of subsea separation

A new joint industry project known as CoSWaSS (configurable subsea water separation system) got underway in September (see page 517).

Initiated by a consortium of oil companies comprising Amerada Hess, Elf Norge, Norsk Agip, Norsk Hydro, BP Exploration, Mobil Exploration Norway and Statoil, the project aims to develop a CoSWaSS 'demonstrator' to be installed on a live offshore field in order to prove the concept of subsea water separation and disposal, analyse system performance and test reliability by 1999.

The system will be designed to separate and dispose of produced water from oil and gas reservoirs using seabed-mounted equipment and employing proven process technology. Benefits are expected to include increased or accelerated production, separation train debottlenecking, increased flowline transport capacity, simplified deepwater development and meeting of environmental constraints.

A three-phase development strategy is proposed:

- Phase 1 comprises a concept definition study expected to cost some

£165,000. The contract for this phase, which will last approximately five months, has been awarded to Kvaerner Oilfield Products Ltd.

- Phase 2 will comprise detailed design, procurement, fabrication/assembly and onshore testing. This phase is expected to commence during the first half of next year.

- Phase 3 will comprise an offshore demonstration for which one of the oil company participants will install and operate the CoSWaSS demonstrator unit on a producing field.

Closer North Sea cooperation

Preliminary studies by Amoco Norway Oil Company, BP Norge and Phillips Petroleum Company Norway have indicated that significant improvements could be achieved in their operations in the southern sector of the North Sea if comprehensive and long-term cooperation were further encouraged between the three companies. They already cooperate within logistics and other parts of their respective operations of the Valhall, Hod, Ula and Gyda fields and the Ekofisk area.

Continuing studies will evaluate what other forms of cooperation are feasible. 'This will have no effect on each company's ownership of assets, nor on their accountability as operators,' states Amoco. Safety and environmental standards are expected to form an important part of the foundation for a possible joint operational cooperation, a decision on which will be made next January.

While the need to become more cost-effective has been a key driver for the study, work has also been inspired by NOR-SOK, the Norwegian equivalent to the United Kingdom's CRINE (Cost Reduction in a New Era) initiative.

Lead exposure

Initial results from studies by Shilu Tong and colleagues indicate that there has been a substantial fall in blood lead concentration in the United Kingdom since 1984, reports a recent issue of the *British Medical Journal*. Comparison was made between lead concentrations in blood samples collected as part of the 1995 health survey of England and those collected during environmental monitoring programmes in the United Kingdom in 1984-87 which compared groups at risk of increased lead uptake from traffic emissions with control subjects living in areas without heavy traffic.

The study also indicates that some 97 percent of people in the United Kingdom exposed only to environmental sources of lead will have blood lead concentrations below the action limit of 0.48µmol/l proposed by other countries.

Increased sales of lead-free petrol since 1987, together with reduced levels of lead in paint and petrol and the removal of lead solder in tins containing food are reported to have contributed to the drop in blood lead concentrations.

However, the authors state that their findings also indicate that the effects of low level environmental exposure to lead, in particular on the longer-term cognitive development of children, remains an issue of concern.

Oil refinery first for Kyrgyz Republic



The Kyrgyz Republic's first oil refinery was opened at Jalalabad last month. The 10,000 barrels of oil per day facility is the first milestone in a programme initiated by President Askar Akaev to develop the country's oil processing industry.

At present the Kyrgyz Republic imports more than 50,000 barrels of oil equivalent per day, mainly from Kazakhstan. Some \$110 million was spent on the import of products in the year ending March 1996, an amount that exceeds the trade deficit over the same period.

The \$12 million refinery project was financed by Kyrgoil Corporation. Formed two years ago, the Calgary-based oil company has also formed a joint

venture with national oil company Kyrgyzneft to redevelop, where viable, the 628 underperforming oil wells in the Kyrgyz Republic sector of the Fergana Basin.

Ramping of production at the new refinery will be tied into the workover programme of these existing wells and there are no current plans to import crude, although most of the infrastructure is in place should it become necessary.

At full capacity, the refinery will produce 60,000 tonnes of gasoline, 195,000 tonnes of diesel and 245,000 tonnes of fuel oil per year, an amount sufficient to meet the needs of both the Jalalabad and Osh regions.

It is planned to double refining capacity next year.

Repsol starts low-sulfur fuel sales

Repsol has introduced a new low-sulfur gasoline at pumps throughout its Spanish service station network, which trades under the names Repsol, Campsa and Petronor.

The new fuel complies with the European Union directive requiring automotive gasoline to contain a maximum 0.05 percent sulfur weight content, which entered into force last month. The fuel contains four times less sulfur than previously permitted (0.2 percent).

The company has invested some 40 billion pesetas in improving and/or constructing hydrosulfurisation units and hydrogen plants at its refineries in order to comply with the new fuel specifications.

Amoco moves out of Central Europe

Amoco has announced that it plans to sell its petrol retail sites in Central Europe as part of a refocusing of strategies to increase retail petrol marketing resources and operations primarily in the Americas. The network of sites to be sold includes four existing outlets as well as 14 others that are currently under construction in Poland, Romania and Bulgaria.

'Although we have been extremely successful with our initial retail marketing

activities in Central Europe, the overall international petroleum marketing growth opportunities that we anticipated have not developed to the extent that we had hoped over the past several years,' said W Douglas Ford, Amoco's Executive Vice President-Petroleum Products. Despite this, he said he is 'confident' that 'potential buyers will recognise the quality retail opportunities' that the company has identified in Poland, Romania and Bulgaria.

Irish interconnector feasibility study

Ove Arup & Partners Ireland and National Economic Research Associates and Pipeline Engineering are to examine the feasibility of constructing a natural gas link between Ireland and Northern Ireland, which will not only guarantee security of supply but also provide access to industry and communities in the border region.

The study has been commissioned by a steering group representing the Department of Transport, Energy and Communications, the Northern Ireland Department of Economic Development, Bord Gáis Éireann and Phoenix Natural Gas. The European Union's TENS programme is providing 50 percent of project

financing.

At present the new Ireland/United Kingdom interconnector provides security of supply facilities should there be an interruption in gas supplies from the Kinsale Head/Ballycotton fields. However, field reserves are forecast to deplete within the next seven years and, unless further discoveries are made, this Ireland/United Kingdom interconnector will be the sole supply source for the south.

Connecting the Bord Gáis Éireann grid to the separate Scotland/Northern Ireland interconnector would provide an alternative supply source in the unlikely event of a subsea failure in the latter.

Beacon unveils new gas price package

Beacon Gas, a joint venture between electricity company Seaboard and Amoco, has announced prices which it claims are 'significantly below' those of British Gas for customers in Avon, Dorset, Kent, East Sussex and West Sussex—the next area in the UK domestic gas market to be opened up to full competition.

The company states it will also offer 'similar savings' in southwest England where trials are already underway.

Benefits on offer include:

- Cheaper gas — 1.36 pence/kWh compared with British Gas' standard tariff of 1.52 pence/kWh.

- Lower standing charges — £26 annually compared with £37 per year charged by British Gas.

- No standing charges in the two winter quarters of 1997 for customers who sign up before 30 November.

- Additional discounts for Direct Debit customers.

- Optional central heating servicing and insurance cover.

The price package amounts to a discount of over £50 on a typical gas bill (£300 per household) compared with current British Gas prices for domestic customers,' said Stephen Gutteridge, Seaboard's Managing Director, Supply.

Chevron opens Kazakhstan outlet

Chevron opened its first brand-name service station outside North America in Almaty, Kazakhstan's capital city, last month as part of a 'logical expansion' of its business strategy in Central Asia. According to the oil company, the new facility is virtually identical to its latest US service stations and is the largest western-style service

station in the region.

Three grades of unleaded petrol, diesel fuel and motor oil are available, as well as a variety of food and convenience items from a forecourt store. Up to 12 vehicles can be fuelled at a time. Pre-paid credit cards will be offered to the public to make the purchase of fuel more convenient.

Moscow service station first for BP

British Petroleum opened its first Russian service station at Severjanin, 12 kilometres northeast of Moscow, last month. The pilot facility is a joint development with McDonald's which has built its first drive-in restaurant on the site.

The complex also features a BP shop offering over 2,000 product lines ranging from car parts to groceries, an automatic car wash, car vacuum cleaner and air line as well as dedicated fuelling lanes with high-speed pumps for commercial transport vehicles.

According to BP Oil Europe Chief Executive Peter Backhouse,

the new site 'introduces the Moscow motorist to the concept of a combined refuelling facility and fast food franchise for the first time'. Located on one of the main feeder roads into Moscow, the service station will be passed by some 80,000 cars per day.

The service station is open 24 hours a day and employs 35 local staff.

Five grades of fuel are offered with product sourced either from selected Russian suppliers or imported.

If the pilot site proves successful, the oil company plans to open more outlets in the Moscow area next year.

Arco to develop new Alaskan oilfield

Arco Alaska has unveiled plans to develop a major new oilfield in the western Colville area on Alaska's North Slope, some 34 miles west of the Kuparuk River oilfield.

A two-year delineation programme, including six wells, four sidetracks and a 3D seismic survey, indicates that the 40,000-acre oilfield has proven and potential reserves of 250 to 300 million barrels with 800 million to a billion barrels of oil in place.

Construction and development of the Alpine field is scheduled to begin in the winter of 1997/98, pending issuance of local, state and

federal permits.

Initial production of 30,000 barrels of oil per day is expected in early 2000, increasing to 60,000 b/d in 2001.

An elevated 34-mile long, 16 to 20-inch diameter pipeline will connect the field to the Kuparuk Pipeline System, which feeds, in turn, to the Trans Alaska Pipeline.

Total field development is expected to cost between \$700 and \$800 million.

Alpine field partners are Arco Alaska (56 percent), Anadarko Petroleum (22 percent) and Union Texas Petroleum Alaska (22 percent).

PowerGen shelves use of Orimulsion

PowerGen has announced that it plans to cease generation at its Orimulsion-fuelled Ince power station at Elton, near Chester, at the end of next March.

The company is also to bring back into operation a generat-

ing unit at Fiddler's Ferry power station at Warrington, that was mothballed in 1994.

The Ince closure will follow the end of a five-year Orimulsion contract which is not being renewed.

Job losses in France's refining and distribution sectors

France-based petroleum companies have shed 2,000 jobs in the refining and distribution sectors since January 1995, to which can be added a further 3,000 in retailing, claims industry body Union Français de l'Industrie Pétrolière (UFIP).

The UFIP members' workforce has been trimmed down from 40,000 in 1975 to 18,000.

Elf-Antar, Mobil, British Petroleum and Total have already announced job cuts programmes and, more recently, Shell has revealed plans to shed around 320 staff employed in its French petrochemicals and refinery divisions.

UFIP members managed to limit losses to FF48 million (before tax and excluding value of stocks and extraordinary items) in the first half of 1996, compared with FF1 billion in the same period last year.

Negative refinery margins had improved markedly from a loss of FF22.02 per tonne to

90 centimes/tonne largely as a result of rising crude prices.

"Even though refinery groups are now close to break-even point, these are still mediocre results and highlight the structural handicaps in the sector in France in relation to foreign competition," explained UFIP President Bernard Calvet.

Downstream, UFIP estimates almost 6,000 stations are threatened with closure which would reduce the country's network of retail outlets to around 12,500 compared with 18,500 in 1995. Independent operators, often located in rural areas, are hardest hit.

Some 60 per cent of the total French retail service station network had disappeared since 1975 in stark contrast to the creation of 3,000 outlets at supermarkets.

UFIP has consistently pointed the finger at the supermarkets' 'loss-leader' policy on fuel retailing as the principal cause

of the network's demise.

In order to re-establish what it terms fair competition in the sector, UFIP, in association with retail distribution groups, lobbied for measures to prohibit the practice of 'selling at a loss'.

However, the proposals were not retained by the government in new commercial legislation adopted earlier this year.

France's Industry Minister Yves Galland recently announced that state aid to independent service station operators in economic difficulty would rise from FF30 million in 1996 to FF60 million next year.

Increased aid would be funded by a tax on supermarkets and hypermarkets with service stations. The amount of tax levied will depend on the size of each supermarket and its turnover.

UFIP has criticised the system of aid as 'ineffective, discriminatory and unfair', underlining that the 3,000 service stations

qualifying for assistance will each receive FF1,600 on a monthly basis — a level of support judged inadequate to guarantee their survival.

Faced with eroding margins in the retail sector, refinery groups are seeking to reduce distribution costs by developing 'bi-traffic' service stations on motorway locations. Instead of building the traditional two outlets facing each other, a growing trend is to build a bridge link above carriageways to a single station serving traffic in both directions.

Elf is also poised to open a 'quadri-traffic' service station at the intersection of two motorways in southwest France, with the aim of reducing operating costs four-fold per litre of fuel.

Other economy measures centre on the development of pre-fab 'modular' or 'turnkey' service stations which reduce construction time by half and costs by 15 to 20 per cent.

European gas in the pipeline

The first section of the Penta West gas line became operational last month after only two months of construction, reports OMV. The 20km section runs from Mauerkirchen, near Braunau, Upper Austria, to Burghausen in Bavaria, where it joins the Austrian-Bavaria gas line (ABG). The new section will have an initial capacity of about 500 million cubic metres.

The link will allow the south of Bavaria to be supplied with Russian gas via the West-Austria Gasleitung and the Oberösterreichische Ferngas pipeline grid.

When completed in 1998, the Penta West pipeline will run from Oberkappel to Burghausen and is expected to operate at a capacity of up to 7 bncm.

Together with Bayernwerk, OMV has also recently applied for the relevant permits required for the construction and operation of a planned extension to the Penta-ABG system into northern Italy. The pipeline, known as Tiba, would connect Bavaria and Italy via the Tyrol.

Offshore cuttings management and processing

A new centre for the recycling of cuttings produced during offshore drilling operations has opened in Lowestoft.

Traditionally, such cuttings have been treated on the platform before either being returned to the seabed or taken ashore for landfill.

The centre — operated by Recovery Systems Ltd, a joint venture between Aberdeen-based Enaco and Soil Recovery of Denmark — cleans and refines the cuttings for reuse, for example, as topsoil or compost.

The plant will handle around 400 tonnes of cuttings per week from Shell UK Exploration and Production — which has played a key role in encouraging establishment of the facility according to Enaco — and other operators in the North Sea.

Although the recycling element of the offshore cuttings management system is based on land, the service in fact manages cuttings

from the time they reach the surface of the well to the recovery and recycling of the end-product.

Up to 8 tonnes of cuttings are contained at the rig site in two sealed skips sited side by side, which are continuously fed by a swivel auger. As one skip is filled, its weight is recorded before being backloaded to either a dedicated vessel kept alongside the rig or a normal supply vessel and replaced by an empty skip.

Once backloaded, the

cuttings are taken to the processing plant located adjacent to the quay at Lowestoft.

A low temperature distillation process at the plant recovers the 'valuable' components of the mud and cuttings. These distillation products, ie oil, water and salt, are recycled for reuse as constituents of new drilling fluids, while the cleaned cuttings themselves have potential value as building material or topsoil.



Cuttings processing facility

Diary Dates



Energy Economics Group

'Fuel in the 21st Century'

**Wednesday 13 November, 17.00 for
17.30 until 19.00**

By Mr John Battle MP, Labour's
spokesperson on energy in the Shadow
Department of Trade & Industry

IP contact: Jenny Sandrock



Exploration and Production Discussion Group

'Towards 2020: Future Oil and Gas Production in UK Waters'

**Wednesday 20 November, 17.00 for
17.30 until 19.00**

By Dr Bryan Taylor, Technical Affairs
Director, UK Offshore Operators Association

IP contact: Jenny Sandrock



Energy Economics Group

'The European Energy Directive: Open Markets Ahead for Electricity'

**Wednesday 27 November, 17.00 for
17.30 until 19.00**

By Mr Graham Ward, Deputy Chairman,
World Energy Group, Price Waterhouse

IP contact: Jenny Sandrock



Energy Economics Group

'Scotland's Opportunity'

**Monday 2 December, 17.00 for 17.30
until 19.00**

By Mr Alex Salmond MP, SNP leader and
parliamentary spokesman on energy

IP contact: Jenny Sandrock

British Gas rejects Ofgas proposals

British Gas has rejected the final Ofgas proposals for the TransCo price control published in August (see *Petroleum Review*, October 1996).

The issue is now to be addressed by a Monopolies and Mergers Commission (MMC) inquiry, which may take up to six months.

According to Philip Rogerson, BG Deputy Chairman, the proposals — which had been revised following objections from the company and its shareholders earlier in the year — remain 'unrealistic and unacceptable'.

British Gas maintains that the new pricing formula would cut TransCo's average annual cash flow after tax by at least £400 million and would not generate an 'adequate return for shareholders'.

The company also argues that the proposals would undermine TransCo's ability to generate sufficient revenue to maintain the UK gas pipeline system.

The series of Ofgas proposals on unbundling parts of TransCo's business into separate competitive activities were also said to be 'still unclear and serve to increase uncertainty'.

New DNV rules for marine operations

Det Norske Veritas has introduced new Rules for Planning and Execution of Marine Operations.

Based on the old *Standard for Insurance Warranty Surveys in Marine Operations* from 1985, the new rules consist of several new items relating to technical and operational aspects.

Emphasis is placed on the human factor which, according to DNV, accounts for 60

percent of accidents caused during marine operations. Technical deficiencies account for the remaining 40 percent.

The rules also introduce a new approach to insurance warranty surveys in marine operations which looks at marine verification as an integrated part of an offshore project. Previously, a separate insurance warranty survey was conducted for the installation phase of a project.

Green light for Mallard development

The UK Department of Trade and Industry has given the go-ahead to Shell, Esso and Total Oil Marine to develop the satellite Mallard field in block 21/19 of the Central North Sea.

Total cost for the development project is estimated at some £100 million.

Mallard is the first of a new generation of high pressure-high temperature fields to be developed by Shell Expro in the North Sea. 'Such fields present a new range of challenges both to the drilling teams and to the manufacturers of subsea equipment' said a Shell Expro spokesman.

The pipeline system chosen for Mallard includes cooling equipment at the subsea wellhead to reduce the pipeline operating temperature to conventional limits.

The field will be developed using two subsea wells tied back to the existing Shell/Esso-owned Kittiwake platform by a 15-km long pipeline.

Oil and gas from Mallard will be processed in a new module to be installed on Kittiwake and will share the platform's existing production facilities. Oil will be exported from Kittiwake via tanker and gas via a pipeline connection to St Fergus.

Mallard is scheduled to come onstream in October next year, just 12 months after government approval. It is expected to reach a daily production rate of 16,000 barrels of oil and 11 million cubic feet of gas.

Recoverable reserves are estimated at 25 million barrels of oil and 17 billion cubic feet of gas.

New refinery planned in Egypt

Repsol and Midor — a company 40 percent owned by Egyptian real-estate group H Salem, 40 percent by private Israeli trading and project development group Merhav and 20 percent by state-owned Egyptian General Petroleum Co (EGPC) — has signed a protocol agreement and contracts regarding the construction and operation of a new refinery in the free-trade zone of Alexandria.

Under the terms of the deal, Repsol will act as the owner's representative supervising engineering, purchase of materials and construction of the project. The company will also act as technical operator of the refinery supplying crude and feedstocks, and marketing products.

The agreement also grants Repsol a purchase option on 10 percent of Midor capital equity, an interest that may be increased to 20 percent upon exercise of this option if the

shareholders so agree.

Scheduled to start production in the year 2000, the \$1.2 billion refinery will have an annual distillation capacity of some 5 million tonnes and produce products with no associated fuel oil.

The plant will be equipped with atmospheric and vacuum distillation units, a hydrocracker for medium distillates, isomerisation, continuous catalytic reforming, desulfurisation, coker and sulfur recovery.

Strategically located with connections to the Suez-Mediterranean pipeline, the Alexandria port oil terminal, the local network of LPG storage tanks and loading station for tankers and the EGPC El Ameriya refinery, the new refinery will be able to serve Egyptian and Israeli markets and further afield. It is estimated that up to 30 percent of output could be exported.

Shell/Texaco propose US merger

Shell Oil and Texaco are reported to be in the early stages of negotiating a possible merger of their US downstream operations in a bid to improve business efficiencies and increase financial returns in a market increasingly hampered by overcapacity and poor returns.

Star Enterprise, the Texaco and Saudi Aramco marketing/refining joint venture operating in the east of the United States, is also involved.

If the deal, which involves assets worth in excess of \$10 billion, goes through, it would create the largest downstream operation in the country.

Shell runs six refineries and operates a network of almost 9,000 retail outlets in 39 US states, while Texaco operates over 13,000 branded service stations in all but five US states, owns four refineries and has a 50 percent stake in seven US refineries through Star

Enterprise. Between them, Shell and Texaco also have a huge oil pipeline network spanning tens of thousands of kilometres.

It is thought that if the merger is agreed two companies would be created to cover the east and west of the United States, respectively, and would account for some 15 percent of the total branded gasoline market share.

The possibility of a Shell-Texaco merger follows hot on the heels of Mobil and British Petroleum's joint plan to combine their European refining, marketing and lubricants businesses, announced earlier (see *Petroleum Review*, April and September 1996).

Discussions on a similar merger between Phillips Petroleum and Conoco in the United States were abandoned after they failed to 'reach agreement on significant commercial issues' (see *Petroleum Review*, June and July 1996).

Heavy oil – the jewel in western Canada's oil play

For western Canadian oil producers making a profit from bitumen has been like the tar sands of Alberta themselves: sticky, tough and unyielding. That was the story of the 1970s and 1980s; but after years of shovelling money into a seemingly bottomless pit the great promise of Canada's heavy oil resource is finally coming to pass.

By Gavin Will

With dozens of new projects coming on stream within the next decade, industry analysts are predicting investments of Can\$25 billion in heavy oil and a tripling of production in western Canada by 2020.

The lure has been practically impossible to resist, since Alberta and Saskatchewan contain a motherlode of approximately 1.7 trillion barrels of bitumen (oil produced from oil sands), of which 300 billion barrels is currently considered to be recoverable. This resource is roughly equivalent to proven reserves of conventional oil in Saudi Arabia, although in western Canada only three billion barrels are recoverable using current technology.

The problem for Canada over the last 20 to 30 years has been how to unlock the resource at a profit. Ever since Suncor opened the world's first commercial oil sands project at Fort McMurray in 1967, governments and operators in western Canada have wrestled with seemingly endless production problems, skyrocketing costs and flat world oil prices.

The nadir was reached in the early 1980s with the cancellation of two ambitious integrated oil sands projects in northern Alberta.

Further difficulties dogged the industry in subsequent years, with government cutbacks and the collapse of oil prices forcing the postponement of several multi-billion dollar projects. Despite numerous setbacks, Alberta's oil sands have remained the jewel in western Canada's oil play. It was only a matter of time before technology and market conditions caught up with the potential that has remained elusive for so long.

Extraction technology

Extraction technology used in removing oil from the sands of western Canada falls into two categories, the most common of which resembles open pit mining which uses truck and shovel techniques. Oil is removed from the sand at an upgrading plant, prior to being sent by pipeline for refining.

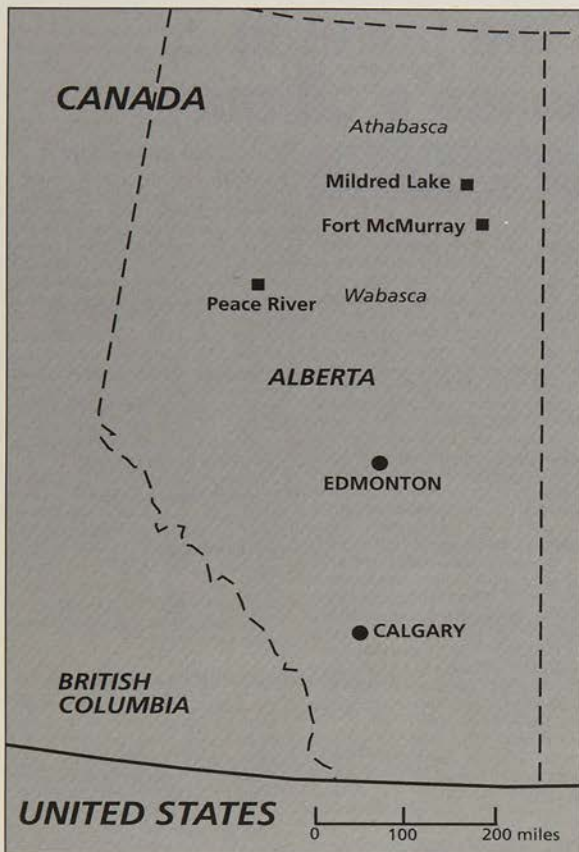
For sites with deeper reservoirs, however, companies use in situ technology, whereby steam is injected into a reservoir to remove crude oil from the sands. Other pressure-driven techniques are also being used, including steam-assisted gravity drainage (SAGD) and carbon dioxide injections.

Much of the current research is aimed at ways of extracting bitumen — which is a thick, viscous mixture of hydrocarbons — at a commercially viable cost. This year the prize seems to be within reach, with the unveiling of Can\$6 billion worth of oil sands projects, most of which are located in the Athabasca, Cold Lake, Peace River and Wabasca regions of Alberta.

Potential from Syncrude

The largest portion of these investments is being made by Syncrude, which is a consortium of 10 companies led by Imperial Oil Resources.

Syncrude plans to spend Can\$2 billion by 2007 on the new Aurora and North mines, which are located near Fort McMurray. Syncrude, which is the world's largest producer of crude from oil sands, currently produces 75 million barrels per year (b/yr) from its open pit operations. With the new mines, the company will increase production to 176 million b/yr. The two-phase project includes a pipeline to transport the bitumen to the company's Mildred Lake upgrading plant. The product, Syncrude Sweet Blend, is considered to



be among the best low sulphur oils in North America and is being extracted and processed at approximately Can\$13 per barrel.

Synchrude spokesman D'Arcy Levesque said by 2000 the company is aiming to bring the cost down to Can\$12 per barrel and boost returns to

shareholders to 12 percent from eight percent in 1995. 'We've made great strides in improving our energy efficiency and reducing operating costs,' Mr Levesque said. 'But we've got to improve our returns in order to be competitive with other investments like the utilities.'

Imperial plans

Imperial is embarking on its own expansion programme at its Cold Lake operation, with Can\$500 million being invested by 1999. The first phase, which will be completed in 1999, will increase production to 130,000 b/d from the current 94,000 b/d. The in situ operation employs cyclic steam stimulation to unlock bitumen — a process whereby steam is injected into the reservoir at high pressure and, after being allowed to seep into the sand, the bitumen is drawn to the surface.

Thanks to steady improvements with in situ techniques, Imperial has improved its recovery of bitumen to about 20 percent from 13 percent since the early 1980s. With further modifications the company expects to boost recovery to 30 percent within the next few years.

Suncor to expand

Suncor, the third largest oil sands producer in western Canada, is also planning significant expansion in coming years. By 2000, Suncor plans to open a new mine in the Fort McMurray region, which is expected to cost Can\$360 million and increase the company's production to 105,000 b/d. Suncor will spend another Can\$320 million on expanding and modifying its plant, which will produce a variety of sweet crudes and custom blends. In addition to this, Suncor is spending \$200 million on environmental measures, designed to reduce emissions from the plant by 75 percent.

The company is also active in Australia, where it is working with Southern Pacific NL and Central Pacific Minerals NL on an oil shale pilot project at Gladstone in Queensland. If the project is successful, the partners will decide whether to proceed with a 4,500 b/d plant. Eventually the Australian operation could produce 85,000 b/d.

Other potential

Shell, which abandoned the proposed Alsands megaproject of Alberta in the 1980s, is planning a more modest

approach in coming years. By next year the company will increase production to 12,500 b/d from the current 7,500 barrels at its Peace River operation. But much larger plans exist for the Athabasca region where Shell holds leases, although spokeswoman Jan Rowley said it is too soon to attach a dollar value. Shell plans to begin production in 2002 and is currently looking for joint venture partners to share the costs associated with the expansion. Ms Rowley said the company's goal is to get a decision on extraction and production technology by next year.

In addition to Athabasca, Cold Lake and Peace River, an expansion of Amoco's Wolf Lake facility is possible. The company, which spent Can\$120 million in the Wolf Lake, Wabasca and Primrose region over the past year, is planning to invest a further Can\$175 million in the project, thereby boosting production by the end of this decade to 55,000 b/d from the current 22,000 barrels. Within five years, total capital investment is expected to reach Can\$500 million. Amoco's current performance and production projections are all the more remarkable since, after selling a 7,500 b/d property last year, the company was left with a post-sale level of 9,000 b/d. 'Our heavy oil operations have met or exceeded our expectations over the past year,' said Rick Brown, Vice-President, Amoco Canada. 'With good management and innovative technology, not only have we recovered the production volume we sold, we have more than doubled our total production in the last year,' he added. Amoco processes much of its feedstock at its refinery in Whiting, Indiana, which is currently operating below capacity.

Other major investments planned by producers by the turn of the century include Koch Exploration Canada Ltd, which is allocating Can\$200 million for a 40,000 b/d project at Reita Lake.

ELAN Energy Inc is planning to spend Can\$225 million at three sites in Alberta and CS Resources Ltd will develop a bitumen thermal project costing Can\$250 million, which will produce 50,000 b/d. While commitments to date

are impressive, plans are in the works for further investments totalling Can\$25 billion in future oil sands projects by 2020. If these proposals come to fruition, total production may be tripled, according to a National Oil Sands Task Force report released this summer by the Alberta Chamber of Resources.

Improving margins

There are several reasons for the explosion of new investments but perhaps the most significant is the profit margins experienced at many current operations. Extraction costs are now in the Can\$13-15 per barrel range, which is half what it was in the mid-1980s. 'We're at the point now where synthetic oil is becoming competitive with conventional oil,' Mr Levesque said. 'This is particularly so when you take into account the cost of exploration for conventional oil.'

With buoyant prices, companies such as Suncor and Syncrude are realising a profit of Can\$10-17 per barrel, although companies are still trying to improve overall returns on investments from heavy oil projects.

Another factor working in favour of western Canada's oil sands industry is a new set of taxation and royalty regimes that encourage investment. This summer the federal government introduced a uniform tax policy for all oil sands operations regardless of the method of extraction. This means in situ projects will be treated on the same basis as truck and shovel mining sites. Royalties on heavy oil projects are now lower than Alberta's land-based conventional oil wells, a change reflecting the larger, but higher cost, oil sands reservoirs.

Last year the Alberta government also announced a standard royalty regime for the oil sands industry, the terms of which include a 1 percent minimum resource extraction royalty, a net royalty of 25 percent after recovery costs, as well as a carry forward provision on the interest allowance on costs.

In addition to these changes, an agreement in June between Syncrude

and the Alberta government on transitional royalties is expected to increase the profitability of the investment for that company and its investors. Don Currie, Executive Director, Alberta Chamber of Resources, said there are other factors contributing to the expected growth in western Canada's heavy oil sector. The chamber's task force report identified strengths and weaknesses in western Canada's heavy oil sector. Mr Currie said the impetus for investment partially emanates from a get-tough attitude by the provincial Alberta government, which has refused to grant the generous lease extensions that it awarded companies in the past.

Many of the largest landholders were awarded 21-year leases in the 1950s and early 1960s which were then automatically extended for an additional 21 years once they had expired. Beginning next year the older lease extensions will end, by which time holders must either make production commitments or turn the lands back to the government.

'Many of these companies have counted their oil sands leases as assets that are carrying millions of barrels and now they face having to explain to shareholders why these assets have been wiped off the books,' Mr Currie said. 'So now they're getting serious, and they're looking towards putting real money into them.'

Shell is one of these companies, although Ms Rowley downplayed the importance of the lease terminations. 'Our activity is really based on market conditions and cost factors, although the leases do factor in of course,' she said.

One requirement highlighted in the oil sands report identified a need to establish markets for heavy oil, as well as expansion of the North American pipeline system in order to handle new production. A number of pipeline proposals have been put forward to expand capacity to the US Rocky Mountain and mid-western regions. With new projects coming onstream, Mr Currie said pipelines will become increasingly attractive. 

A stronger perfume for LPG?

By CK Willcox
Marketing Manager,
Speciality Chemicals,
Elf Atochem

The odorisation of Liquefied Petroleum Gas (LPG) is undertaken to improve the safe use and transport of this popular fuel. Effective LPG odorisation should enable leaks to be detected by any person with a normal sense of smell before gas concentrations reach a hazardous level. The objective is identical to that for odorising natural gas. However, the physical characteristics of propane and butane present particular difficulties. These do not occur with natural gas, which has a dynamic, flowing, simple-phase system.

For the past 50 years, ethyl mercaptan (EM) has been the most widely used LPG odorant because of its low odour threshold, low boiling-point and high volatility. However, its use does present certain problems in the odorisation process, as well as in transport, handling and storage. These factors have led to the development by Elf Atochem of a new LPG odorant, Vigileak 7030, a dedicated mercaptan/sulfur blend, to ensure safer and more effective odorisation of LPG.

Odorisation problems

The main criteria for a good LPG odorant are:

Odorant power: a strong, characteristic, unpleasant and persistent odour

Physical properties: good evaporation in the gas phase

Chemical properties: it should be non-corrosive, non-toxic and stable.

Boiling-point Propane and butane are transported as liquids under pressure but are normally used for domestic and commercial applications as gas which vaporises from the pressurised liquids. The ideal odorant should therefore have the same boiling-point as propane (or butane) to ensure uniform vaporisation with the liquid. Thus, concentration of odorant in the vapour during the early stages of vaporisation should be identical to that in the final stages.

No known odorant satisfies these criteria. Because propane and the odorant have different boiling-points, the initial vaporised liquid from a full container contains less odorant than the liquid itself. As vaporisation continues, the vapour and the liquid both become progressively enriched with odorant. The liquid phase will always contain a higher concentration of odorant than the vapour phase, with odorant accu-

mutating in the residual liquid (see **Figure 1**).

Volatility The other important physical constraint in LPG odorisation is volatility. Volatility is characterised by the vapour/liquid equilibrium (K-value). An effective odorant will therefore have a low boiling-point and high K-value. **Figure 2** shows the K-values of the main mercaptans and sulfides used in LPG odorisation.

Odour fading It is possible for the odorant, especially mercaptans, to be oxidised into odourless disulfides inside long pipelines or in contact with container walls (in the presence of rust, for example). This leads to the phenomenon known as odour fading. This is why ethyl mercaptan has been totally replaced in the natural gas market by other odorants or, in one or two cases, remains only as a minor constituent of a blend.

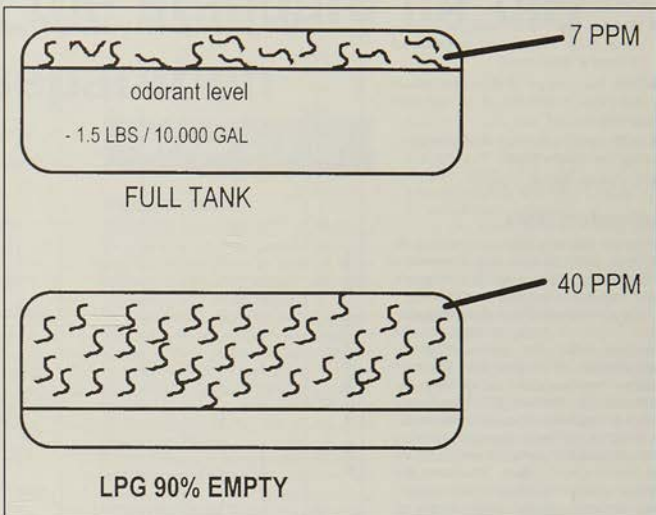
Toxicity Ethyl mercaptan is labelled as very flammable and toxic (hazard number 336).

New odorant

Elf Atochem, responding to concerns expressed by customers regarding ethyl mercaptan, embarked upon a research programme to develop a new odorant for the LPG market. A guideline for this project was to find the ideal chemically synergistic combination of a mercaptan and a sulfide. In general, sulfides are stable, ie highly resistant to oxidation. Mercaptans have high odour impact. The best is tertiary butyl mercaptan (TBM), which not only has a very low odour threshold but also a good 'gassy' odour. The result of this research is Elf Atochem's Vigileak 7030, a 70:30 blend of dimethyl sulfide (DMS) and tertiary butyl mercaptan (TBM) respectively. A strong, persistent and unpleasant odour can be detected at very low concentrations and recognised as a gas smell by most people.

Figure 1

Level in Gas Phase



DMS was chosen as sulfide for several reasons:

- DMS has the highest oxidation stability of all sulfides. When blended with TBM, the chemical stability of Vigileak solves the odour fading problem
- DMS is a particularly volatile compound

● DMS odour can be detected even at very low concentrations

● DMS has the best soil penetrability of all odorants.

When blended with TBM, the odour intensity is enhanced because of a certain synergistic effect — odour is more intense than each component on its own.

	boiling point (°C)	K-value 15°F (-9.3°C)
EM	35	0.184
DMS	37	0.150
TBM	64	0.035
THT	121	0.012
IPM	52	0.080
MES	67	0.030

Figure 2

Figure 3

TBM was chosen as mercaptan for the following reasons:

- TBM has the highest oxidation resistance of all mercaptans (because of its sterical hindrance)
- TBM has one of the lowest odour detection thresholds of all odorants on the market
- TBM is one of the best odour enhancing boosters of DMS
- Soil penetrability is good.

Laboratory tests

Vaporisation tests were carried out on Vigileak and EM with two commercial 13kg carbon steel propane containers, both reconditioned and reapproved.

The two curves show the concentration levels of each odorant in the propane during the various stages of vaporisation. As Vigileak and EM have similar K-values and the same dosage has been added, one would assume identical, superimposed curves (see Figure 3).

However, EM reacts chemically with the iron oxide of the container walls resulting in an absorption effect. This leaves the propane with a 50 percent lower odorant concentration in the initial stages of vaporisation, compared with Vigileak.

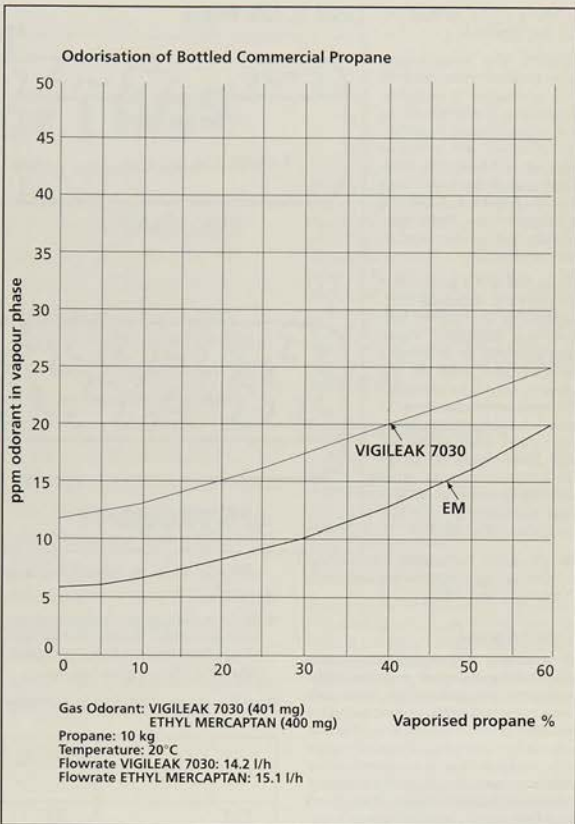
Given the worldwide safety level of odorant concentration of approximately 10mg/m³ in the gas phase, Vigileak 7030 achieves this level from the very beginning when the bottle is first commissioned. With EM, the safety concentration level of 10mg/m³ is only reached after 30 percent of the propane in the bottle has been vaporised.

Both Draeger and Gastec have developed stain tubes especially designed to detect Vigileak 7030.

Conclusion

As a blend of DMS and TBM, Vigileak is not classified as 'toxic', only as 'very flammable.' This is a particularly important in case of any accidents on public roads.

Vigileak presents the best combination of an effective as well as safe odorant.



Inhalation toxicity

	EM	TBM	DMS
LC50(rat) ppm/4hr	4 420	22 000	40 000

Transport regulations

	EM	TBM and DMS
Danger number	336	33
	very flammable and toxic	very flammable

Figure 4

Setting the standard for oily water separation

Oikos Limited opened a new oily water separation plant last month.

Located at Hole Haven Wharf in Canvey Island, Essex, the £1.5 million facility has been designed to remove oil to levels of, on average, just 0.5 parts per million (ppm) of free or emulsified oil in the final effluent produced by the treatment of oily water mixtures. Such a target more than meets current European Union environmental standards, the most stringent of which are to be found in Germany and the Netherlands.

Designed and built by Kalsep Limited, the Camberley-based water treatment specialist, the new oily water separation plant is based on a membrane-filtration system incorporating centrifugal separation, microfiltration, carbon absorption and ion exchange. According to Darryl Flukes, Managing Director of Oikos, the plant marks a 'world first' for the oily water separation market in that while each element of the new system has been used individually in processes other than oil/water treatment, it is thought that this is the first time that they have been used together in such a configuration.

By Kim Jackson

Going it alone

Previously, Oikos relied on the settling process in its storage tanks to separate out the oil on which its core oil reclamation business is based, with the remaining oily water shipped by barge to a specialist contractor in Amsterdam for further treatment. 'The cost of going to third parties was so inhibitive — both in terms of cost and in the type of products we could handle — that we decided it would be easier to do the processing ourselves,' Mr Flukes told *Petroleum Review*.

'We decided that we would not go for a "cheap and cheerful" solution, but would design a plant that would meet all future European Union environmental regulations,' he explained. 'It was important that the system be designed to handle the complete range of oil qualities — from gasoline to heavy oil — and percentages of water contamination.'

Oikos found a suitable site to set up its operation at Hole Haven Wharf on Canvey Island where a bulk storage terminal was being sold off by Transport Development Group (TDG) as part of a drive to divest itself of non-core operations. 'The site suited our book in terms of both its location and the facilities it had available,' stated Geoff Booker, Director of Oikos with special responsibility for business development in the United Kingdom, northern Europe and the Middle East.

'Not only was it the most seaward liquid bulk storage installation in the Port of London, it was also the only independent storage facility to be connected to the UK oil pipeline networks, UKOP and GPSS, delivering product throughout the United Kingdom including the three major airports at London Heathrow, Gatwick and Stansted,' explained Mr

Booker. 'It also had 100 storage tanks, ranging from 50 to 20,000 m³, of which two 2,400 m³ capacity tanks will be used as feed tanks, and held a number of licences relating directly to Oikos' core oil reclamation activities.'

The site is also served by three jetties capable of handling vessels up to 220 metres length overall (LOA) and 11.5 metres draft at low water. More than 20 lines, including stainless steel, lagged and traced lines, link the jetty to the storage facilities.

The terminal was purchased from TDG in 1994 for £2 million. Since then, over £1 million has been spent revitalising the facility which had effectively been mothballed. Oikos has also invested in a fully equipped laboratory which is capable of testing products to relevant British and international standards. The laboratory not only tests the feedstock and separate oil and water streams produced by the treatment process but also offers a complete analysis service for the full range of hydrocarbons for third parties.

Step-by-step separation

In the new separation facility, the oily water mixtures derived from tanker washings, contaminated cargoes, dirty ballast waters, accidental spills, recovered lubricating oils and storm-water runoff undergo a series of processes which separate the mixture and produce (1) blended fuel oil and (2) purified water containing, on average, less than 0.5 ppm of free or emulsified oil.

Preliminary separation takes place in the storage tanks from which the two 2,400 m³ capacity primary feed tanks for the treatment plant are supplied. Oily water parcels are fed to the separation facility at a maximum inlet flow rate of 21 m³/hour. Returns from both the primary separation and microfiltration stages are piped back to the feed tank, with a

biocide injected into the return line controlling biological activity within the tank.

The oily water mixture undergoes a four-stage treatment process:

● **Primary separation** Coarse solids are removed by a strainer system prior to the feed stream being heated by a heat exchanger. The viscosity of the oily water mixture determines which operating temperature — ambient, 45°C or 98°C — is required. The feedstock is then supplied to a centrifuge which separates the oil from the water to give an oil stream of maximum 1 percent sediment and water content and a water stream with a very low oil contamination.

● **Microfiltration** Crossflow microfiltration removes the emulsified oil from the waste water to concentrate and destabilise the emulsion prior to further disruption by the next pass through the centrifuge. The microfiltration process also removes residual micro-solids, including heavy metals in colloidal form.

● **Carbon absorption** Activated carbon filters remove the residual levels of soluble hydrocarbons that pass through the microfiltration membranes. A two-stage 'lead and lag' series system provides two 100 percent capacity absorption vessels and allows one filter to be recharged whilst maintaining continuous throughput. This is of vital importance as the treatment plant runs on a 24-hour basis in order to maximise the return on Oikos' investment.

● **Ion exchange** The ion exchange stage provides the final purification by removing dissolved heavy metal contaminants to meet designated levels — a process often not done in other less sophisticated treatment systems. A two-stage 'lead and lag' system provides two 100 percent capacity ion exchange units to allow insitu regeneration of each vessel whilst maintaining continuous throughput for final discharge. The effluent containing the heavy metal concentrate is removed and stored in a special tank prior to collection by a

licensed waste contractor. The treatment plant is designed for a throughput of 21m³/hour and will handle some 120,000 tonnes of oily water mixtures annually. All volatile organic compound (VOC) release is controlled throughout the treatment process. All vents upstream of, and including the activated carbon stage, vent through activated carbon for the adsorption of VOCs to non-detectable levels. A separate carbon adsorption system is also connected to the feed tank vents.

Complementary operations

Since arriving at Canvey Island, Oikos has successfully built up its bulk storage business — tanks are at full capacity for

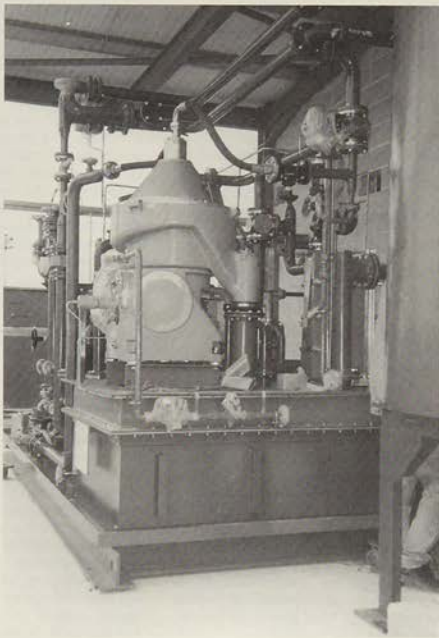
at least 70 percent of the year. In future, the company believes that the oily water separation plant will operate in tandem, with the storage smoothing out the peaks and troughs in the feed to the separation plant.

'The flow of product in the oil reclamation business is very much a case of feast and famine,' explained Mr Flukes. 'The beauty of our operation here is that our storage capacity, which is not directly associated with the treatment plant, allows us to take the volumes produced during the feast, store them and use them to feed the treatment plant during the famine.'

Room for expansion

The treatment facility has been designed with expansion in mind. 'It would be fairly easy to install another centrifuge in the primary stage of the process that would effectively double capacity,' said Mr Booker. 'However, there is a limit as to how much extra capacity can be built in as the rest of the treatment process becomes a bottleneck.'

Mr Booker pointed out that the level of investment required to set up a similar operation elsewhere in the world would be high. However, Oikos had several advantages working in its favour. 'We already had the tankage and facilities here to justify establishing our separation business,' Mr Booker explained.



Centrifuge unit, oily water separation plant

Production spar is launched in the Gulf of Mexico

In early September, the hull of the Neptune Spar arrived at the Ingalls Shipyard in Pascagoula, Mississippi, after a 21-day journey from the shipyard in Finland where it had been built. After a christening in US naval tradition, it left harbour for installation on site in the Neptune field in mid-September. Less than two years had passed since Oryx Energy and CNG Producing announced their choice of a production spar for the development of their Gulf of Mexico Neptune field. Neptune, in water depths ranging from 1,500 to 2,500 feet and with estimated gross reserves of 50-75 million barrels oil equivalent (mboe), is located in four blocks in the Gulf's Viosca Knoll area, some 90 miles south of Mobile, Alabama. Production, which is scheduled to begin next January, is expected eventually to reach 25,000 barrels/day (b/d) of oil and 30 million cubic feet/day of gas.

By Judith Gurney

Spars

In its simplest form, a spar is a floating, hollow, cylindrical structure similar to a buoy. Spars have long been used as ocean markers and for gathering oceanographic data. A well-known American example of the latter was the US Navy spar placed in service in 1965 known as 'Flip' for its ability to shift from a vertical position to a horizontal position for navigation purposes. In the mid-1970s, Shell installed oil-loading spars in the North Sea which stored crude oil for later transfer to tankers; the name of its Brent Spar is now well known following last year's outcry over plans for its disposal in the Atlantic. Other recent spars include a telegraph relay station offshore Japan and a gas-flaring facility off western Africa. However, the Neptune spar is the first spar designed for production.

Neptune field

Texaco, as operator, Amerada Hess and Oryx acquired the lease of block VK 826 in 1984 in an offshore federal government auction. They drilled their first well in 1989, and shortly thereafter, Texaco and Amerada Hess sold their interests in the project to Conoco and Oryx. Oryx, now the operator, and Conoco each held 50 percent interest in block VK 826. They subsequently purchased adjoining block VK 825 from its leaseholders and acquired adjoining blocks VK 869 and VK 870 in an offshore lease auction. Exploratory wells established the presence of multiple hydrocarbon pays - mostly oil - in a Flex trend in Miocene and Pliocene sands at 5,800-11,800 feet. In July 1994, Conoco sold its shares in the project to CNG

Producing Company; five months later, Oryx and CNG announced their plans to proceed with development of the now unutilised four-block area.

An unusual venture

Neptune is novel project for both of the companies. Oryx Energy, an independent US oil and gas company active in the UK North Sea and elsewhere outside the United States, decided early in 1995, after two years of net losses, to concentrate its exploration and development plans and overall growth strategy in the Gulf of Mexico where it had long been involved through its connections with the Sun Company. (It still conducts some of its US domestic energy business through Sun Energy Partners).

At the time, Oryx had interests in some 115 blocks in the Gulf of Mexico in various stages of exploration and development. Its focus, however, was on prospects in shallow waters where it used its extensive experience and technological expertise to fast-track projects, often proceeding from development to production in two years or less. It was involved in only two deep-water projects with good prospects. One was Neptune, where it was the operator; the other was Baldpate, where Amerada Hess was the operator. Baldpate's estimated reserves are greater than those of Neptune - some 100-200 mboe. Located at depths of around 1,650 feet in the Garden Banks area 110 miles off the Louisiana coast, production is scheduled to begin in 1998.

Consolidated Natural Gas, the other Neptune partner, was primarily concerned, until very recently, with the transportation, distribution and marketing of natural gas in regulated US markets in northeastern and mid-Atlantic states. In the face of deregulation and increased competition, CNG

The world's first Spar production platform under construction by Aker Rauma Offshore



widened its business focus to include, among other things, increased activity by its subsidiary, the CNG Producing Company which then had interests in the Gulf of Mexico as well as in several onshore locations.

CNG Producing's first deepwater project was a 37.5 percent interest in Popeye, a gas field operated by Shell Offshore in 2,160 feet in the Green Canyon area which began production last January. Neptune is CNG Producing's second deepwater venture, one in which CNG Energy Services Company, another subsidiary of Consolidated Natural Gas, is also involved. CNG Energy Services is a partner in a venture that is constructing a pipeline system to gather gas and oil from production platforms in the Viosca Knoll and Main Pass areas of the Gulf of Mexico. The system involves a gas line from the Neptune Spar which will connect with two platforms in the Main Pass area and finally with a line owned by Tetco connecting the last platform with the Louisiana shore. They are also laying an oil line from the

Neptune Spar via a Main Pass platform to a Shell crude oil terminal on a second Main Pass platform. The oil line will have a capacity of 160,000 b/d and, like the gas line, is expected eventually to serve several fields in the Main Pass and Viosca Knoll areas which are scheduled to go on stream by the end of the decade, and perhaps later fields in the Mississippi Canyon deepwaters.

Deepwater projects now feasible

Only a few years ago, the development of a field in the Gulf of Mexico as deep as Neptune would not have been practicable. Companies began occasionally drilling in deepwater sites in the mid-1980s but the technology was then lacking to produce any discoveries economically, particularly after the fall in oil prices after 1986. Interest in frontier sites and, in fact, in the entire Gulf of Mexico, dropped noticeably between 1989 and 1993. Circumstances then changed, leading to a remarkable revival of activity in this basin. The

change was the result of the convergence of several developments. The first of these were seismic technological advances. The improvement of 3-D seismic, combined with a geometric increase in storage and capabilities of computers and advanced software programmes dramatically trimmed exploration and development costs. With improved, up-to-date data, operators could avoid drilling costly dry holes, site delineation wells more accurately and anticipate down-hole problems. Now 4-D time-depen-

dent seismic provides them with the opportunity to monitor reservoirs during drainage, fine tune their production strategies, and locate bypassed pay.

The second factor has been the development of new types of offshore production systems. Advances, partly through the use of new materials, in the capabilities of tension leg platforms, spars, other FPSs, complaint towers and extended subsea systems have provided alternatives to massive fixed production platforms. Finally, the discovery of large oilfields in Gulf of Mexico deepwaters, such as the massive Mars field, suggested that such fields were worth pursuing. Shell production tests on the Bullwinkle field, in particular, showed that deepwater reservoirs were capable of high well productivities.

Neptune spar construction

In 1995, two contractors with extensive North Sea experience, J Ray McDermott and the Norwegian firm, Aker, formed a new company, Spar International, to

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promote, market and contract for deep-water platforms using the spar technology. Several months earlier, Aker had purchased the Finnish company Rauma Offshore Contractors, which was already involved in the commercial development of production spars. Spar International has an exclusive license agreement with Deep Oil Technology, which holds the background patent rights for spar technology.

Work had already begun on the Neptune Spar before the new company was officially formed, with Aker and McDermott sharing the responsibility for its construction. Aker was in charge of the engineering and construction of the 705-foot hull and mooring systems; McDermott was responsible for the construction of the topsides, procurement of production equipment and related systems, and platform installation. The hull, which contains 12,640 tons of steel, was built by Aker Rauma Offshore at the Mantyluoto Works Yard in Pori, Finland.

The Neptune Spar hull has an overall diameter of 72 feet and contains a square centrewell measuring 32 feet by 32 feet. This can contain as many as 16 rigid steel risers connected to standard production wellheads on the ocean floor and to surface trees in the spar's topside. Each riser is supported by individual buoyancy modules which are free to move vertically relative to the spar hull, while a stem at the top of these supports the tree. Flexible flowlines connect the trees to the process facilities. The spar's hull does not support the weight of the production risers as happens with tension leg platforms; instead the weight of each riser is carried by its buoyancy modules. The hull has horizontal ring frames with vertical stringers on the inside and mid-deck supports every 40-50 feet. It is double-walled 20 feet above, and 20 feet below the water line. A key feature of the outer hull design are its spiral plate stakes designed to minimise vortex-induced vibrations caused by high currents, particularly the loop current in the Gulf of Mexico.

The upper portion of the hull contains compartments around the centrewell which are designed to be filled

with air to provide buoyancy. The middle section is intended to be flooded with seawater to provide weight and stability (in a spar sited out of reach of pipelines, this section could be used for oil storage). The bottom keel also has compartments which can serve to provide buoyancy when the spar is in transit and which will contain ballast when the spar is on site. There are variable ballast tanks that can be filled or emptied, if needed, to offset temporary loads on the spar. With a draught of 650 feet, the spar's buoyancy is centred near the top of the structure, above the centre of gravity.

The hull was completed in 18 months and then shipped to Pascagoula, Mississippi. Meanwhile, McDermott had completed the construction of the 100 feet by 130 feet topsides in a shipyard in Morgan City, Louisiana. The bottom deck of this three-level integrated structure carries equipment for production operations including surface trees, transfer pumps and separators as well as facilities for oil and gas metering, compression and water cleanup. The mezzanine deck contains an accommodation module for a permanent crew of 18, production processing equipment, a generator package and the unit's flare boom. The top deck is reserved for a large workover rig package to be installed as needed during the life of the field.

Final assembly of the Neptune Spar did not occur in Pascagoula. Instead, the hull had to be towed horizontally, with air in its lower ballast tanks for buoyancy, to the Neptune field in block VK 826 where a taut catenary mooring system was already in place. This consists of six lines composed of chain and wire, with each line anchored to the seafloor 1,930 feet from the surface by a 180 feet long, 7 feet diameter pile. Once in position, water pumped into the lower ballast tank forced the Neptune Spar, like its prototype 'Flip', to upend in a vertical position. Mooring lines were then attached by a temporary work deck. This has now been replaced by the topside. A workover rig on the top deck will perform well-completion activity and initiate production. After tests are completed, commercial output is scheduled to start next January.

The spar can handle production of 25,000 b/d liquids and 30 million cubic feet of gas per day (mncuft/d).

The future for spars

Spar International has recently signed a contract with Chevron for another, larger production spar, one with drilling capacity on its topsides, for Block 205 in the Genesis field, with water depths of 2,600 feet, in the Green Canyon area of the Gulf of Mexico. Production spars are also under consideration for other projects in this basin as well as in the west of Scotland and the Norwegian North Sea. Advantages of a spar include:

- Relatively low cost of straight-forward construction (spars can be made of concrete as well as steel) in a short period of time, thus allowing fast-track development.
- Stability, with only slight movement on site. This permits the use of large-diameter rigid risers and the siting of trees at the surface where they are shielded from waves and currents.
- Flexibility for drilling needs. The Genesis spar will include drilling facilities; the Neptune spar can be moved up to 250 feet in any direction without disconnecting mooring lines to allow drilling from a semi-submersible rig.
- Relocation capability. This permits the phased development of a field and use in another project. This is an important advantage in the Neptune field, for instance, whose reserves are located over a wide area around a salt dome.
- Ability to store oil, which is useful in sites where pipelines do not exist.

Production spars are one of several alternatives for deepwater sites although the cost and weight of risers may be a limiting factor in ultra-deep waters. The Neptune experience should give a good indication of their value. Companies will be monitoring the performance of the Neptune, and later the Genesis Spar as they decide on the type of production system for their frontier projects. 

Subsea technology update

For most of the last decade, when offshore specialists have gathered to speak about 'new technology', the main subject of discussion would likely have been a subsea development or new piece of subsea hardware. Subsea production, which began to be taken seriously in the UK sector of the North Sea in the mid-1980s with the Highlander (Texaco) and Scapa (Occidental) projects, has certainly been one of the key buzzwords around the industry, as fields began to get smaller with more marginal economics, at a time before 'deepwater' was an adjective that could be applied here.

In the last year or two, however, since UK operators 'discovered' the floating production system, subsea has had to take a back seat. Even though floaters and subsea wells are often intrinsically entwined, the vessel and its associated technologies — and challenges — have become the primary topic of conversation, while the subsea production element is now seen as more mundane and, even, matter-of-fact.

The reason that subsea production technology is now being taken for granted is due primarily to its success.

By Steve Sasanow
Editor,
Subsea Engineering News

There could hardly be an operator anywhere in the world who would shy away from a subsea production scenario because of lack of confidence, infield equipment experience or uncertainty about reliability. Subsea is now as much 'accepted technology' as the simple wellhead platform. There certainly remain good reasons for opting for alternative production schemes but they are not allied to any perceived reliability issue.

For example, using 'dry' wellheads and xmas trees for a deepwater development with a large number of wells, such as with a tension leg platform or a spar, would be expected to be less expensive for workovers that would be carried out from the platform rather than a mobile drilling unit. This is not a reliability issue but one of ordinary maintenance.

In fact, a past president of the Society of Petroleum Engineers said a number of years ago that subsea hardware was 'the most reliable equipment this industry has ever produced.' While there have been a few notable system failures and some recurring equipment problems that the industry would love to overcome, there has never been a failure of a subsea production system that has resulted in a major pollution event nor loss of life. It is no wonder, then, that subsea and not normally-manned platforms have grown in use since the Piper Alpha accident nearly a decade ago.

While floaters are currently attracting much of the industry's attention, subsea technologists have been getting on with developing new techniques and testing and deploying the next generation of subsea hardware that they hope will increase even further the use of subsea production, while also bringing down the cost.

Subsea flowbase

A little discussed piece of technology is the subsea flowbase, probably one of the least 'sexy' items of hardware imaginable, but its growing use has had an impact on the cost of subsea developments. Simply explained, a flowbase allows one well to be flowed to and then commingled with a second well in what is generally described as a 'daisy-chain'. So where is the saving? Anyone who has ever seen a subsea project cost breakdown would have noticed that the two biggest items are always the drilling and completion work and the pipelines. A flowbase allows production from two or even more wells to be transported in a single flowline without resorting to a commingling manifold. No subsea structure and a single flowline equals major cost saving.

Because the flowbase does not qualify as a major innovation, it is difficult to pinpoint its first application in the UK sector, but it is believed that it was by Shell UK Expro on the Brent South development. Since then its use has spread. BP has used it on its West of Shetlands Foinaven, project as has Mobil North Sea on Nevis South. This latter development is a good illustration of an alternative benefit of the flowbase. Nevis South is one part of the bigger Nevis satellite structures to Mobil's Beryl complex (9/13). Mobil is developing this and several other smaller structures in the area in a phased manner. The use of flowbases not only allows an operator to drill and tie back wells over an extended period of time but also avoids the heavy upfront investment associated with a manifold or template development. Mobil has installed a subsea chemical and hydraulic distribution unit but even this is a smaller, cheaper beast than is used elsewhere.

One drawback of the flowbase is that it reduces the flexibility for individual welltesting. Testing can be carried out but it would require systematic well shut-ins, something that operators like

to avoid if at all possible. The answer to this dilemma, while avoiding the cost of an additional testline, is the subsea multiphase meter (mpm). The technically proven subsea mpm which can provide a percentage breakdown on oil, gas and water in the wellstream has been at the top of every subsea engineer's Christmas list for a decade. Several units have been tested and many have now been ordered but there has not actually been any operational experience to date.

Multiphase meters

The first subsea mpm to be installed anywhere in the world was by Amerada Hess last year on the South Scott satellite field. The application here was not welltesting but reservoir monitoring with Amerada concerned about keeping tabs on water production. Unfortunately, a system failure unrelated to the measurement operations of the meter, supplied by Fluenta, meant that the mpm had to be retrieved for repair. As the mpm was not essential for operations early in field life, the operator did not want or need to charter a vessel specifically to reinstall it. The result was a more extensive testing programme that gave Amerada full confidence in the mpm. It is now ready to return to the seabed as part of the current installation programme at Amerada's latest Scott satellite, Telford.

There are a number of mpm manufacturers who have secured contracts. Framo Engineering secured its first subsea order—it has supplied a significant number of topside mpm—from Western Mining Corp in Australia for its interesting East Spar development. Framo will supply two mpm's for this project which will involve the first significant application of an umbilical-less control system. The two-well gas development will be controlled from Varanus Island, 63 kilometres away via radio link with a navigation, communication and control (NCC) buoy. Framo will also supply two subsea mpm's to BP for use at the Monan and Machar fields, part of the ETAP regional devel-

opment in the Central North Sea.

Multi-Fluids International, yet another Norwegian company which has successfully developed a subsea mpm, has won a contract to supply mpm's to Statoil for the Gullfaks Satellites Project which includes the development of the Gullfaks South, Rinfaks and Gullveig satellites to the main three-platform Gullfaks complex.

Framo may well also be the supplier of the first subsea multiphase pumping system to be used in the UK sector. The Norwegian manufacturer built, tested and supplied the first such system to Norske Shell. SMUBS uses the energy from a water injection line to drive a turbine and produce the power to run a pump to add energy to the wellstream of the Rogn South subsea well, part of the Draugen development. BP is now looking at using a similar cartridge-type pump for the second phase of Machar when water injection will be required. Although the water will drive the oil from the reservoir at Machar, it will also slow down the total wellstream. The pumping system will provide extra drive to push the fluids 35km to the central processing facility at Marnock.

Changing separation needs

During the last decade of technical developments, the perceived competition to multiphase pumping has been subsea separation. Rather than employing a pump that could drive oil, gas and water in a single line, the idea was to separate the gas and liquids and move them separately. There have been several prototypes built, eg Kvaerner Booster Station (KBS), at least



deployed in a trial (BOET's Subsea Separation Unit) and one in the bidding stage (Petroboost). It remains basically an untried and under-developed technology.

In the last year, though, the *raison d'être* for subsea separation has changed. Work both in the United Kingdom and Norway has focused not on separating gas from the liquids, but water from the hydrocarbons and disposing of it either directly into the environment or back downhole. The reasons are multiple. In relation to floating production systems, eliminating water from the wellstream could reduce the size and number of production risers and possibly eliminate a water injection riser if the produced water were injected directly back into the formation. Reducing the water being brought to the surface would also reduce the water processing facilities required on the floater.

There are also benefits for ageing

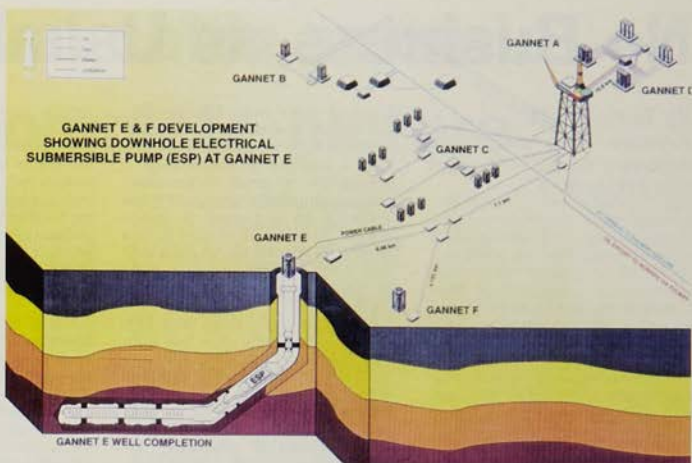
conventional platforms. Operators, facing the prospect of decommissioning a platform, are always searching for potential tiebacks to extend the economic life of its facilities. The cost of platform modifications can, in some instances, make a satellite development uneconomic. If some of the new processing, ie water treatment, equipment could be put on the seabed, even simply adjacent to a platform, it could improve the viability of such a tieback.

In light of these potential benefits, a consortium of six operators, led by BP, has just set up a joint industry project (JIP), dubbed CoSWaSS (configurable subsea water separation systems). The three-phase project is being carried out by Kvaerner Oilfield Products, supported by sister company Kvaerner FSSL, based on the original KBS development. The JIP will include an initial concept definition study, followed by detailed design, fabrication and onshore testing of a prototype system and finally an offshore trial.

Floating production systems favoured

The recent promotion of the floating production system to near the top of the list of development scenarios is due to a number of factors. First is the desire by operators to develop reservoirs that are remote from existing infrastructure. A floating production storage and offloading system (fpso), in principle, can be a totally standalone unit, although in practice at least two of the current projects — Conoco/MacCulloch and Shell/Curlow — will have total or partial export by pipeline.

The other main factors are capital



expenditure and decommissioning. Most of the latest wave of floaters are being provided by contractors on lease, based either on a specific dayrate or a level of production. What could be better for an operator than to pay for a vessel as it produces income and not worry about decommissioning or disposing of the unit at the end of field life.

But back to the first factor, — what is remote? There is a current project that could shift the balance away from floaters and back to subsea tiebacks. Shell UK Expro is developing the Gannet E subsea satellite well, equipped with an electric submersible pump (esp), 14km back to the Gannet A platform. There have been only two previous examples of esp's being installed in subsea wells. Petrobras installed an esp in a non-producing well about 1km from a platform, while Amoco has esp's in a full suite of subsea wells at Lihua 22-1, offshore China, but the wells are directly below a floater.

Subsea and reservoir specialists who have looked at the issue of wellstream boosting have always asserted that the

best place to impart energy to the fluids is downhole before entrained gas has the opportunity to break out. But esp's have had a reputation of being unreliable and the potential need to bring in a drilling unit to pull the completion and the pump made the concept look uneconomically questionable. At Lihua, this is not an issue with a semi deployed permanently above the wells.

Reliability has become less of an issue with the esp recently. The Gannet E development is by far the furthest esp tieback and has pushed esp system designer and supplier Lasalle Engineering to begin testing its systems for a 30km tieback. Lasalle's contract with Shell is based on a mean time to failure (mttf) of two years, although this might be conservative. At one time, the mttf for esp's was as low as 90 days.

If the industry confidence in esp reliability grows and if such equipment could be made to operate out to 30km and then possibly 50km, then long-distance subsea tiebacks to existing platforms will, once again, look a great deal more economic than building or converting floaters.

No Business as Usual

By Terry Knott.

Published by the British Petroleum Co plc. 174 pages. ISBN 0 86165 202 9

This book is the story of the development of the Andrew field, written for BP Exploration which discovered it in 1974. A small and complex reservoir, it was destined to remain an unrealised asset until 1990 when 'BP was embarked on a journey of radical change'. Andrew was selected to be a flagship for BP's new way of doing business, which would show how to make the unpromising field a viable producing asset.

BP took two revolutionary steps, firstly to make their contractors their partners and secondly to trust these contractors to do the best job on their own instead of appointing a BP team to shadow them and check up on every step. The alliance consisted of BP and seven contracting companies for design, management, fabrication, transportation and installation. The aim

was to meet an ambitious set of performance criteria by mobilising the experience and skills of all members of the alliance.

The most remarkable change was to bring suppliers into the new freer way of operating, embodying the messages of CRINE (Cost Reduction in the New Era) initiative, introduced by UKOOA. Suppliers were allowed to offer standard components wherever possible and to make their own contribution to the cost-saving and accelerated path to production.

This approach led to a period of two years and four months from go-ahead in 1994 to first oil. The project

came in six months early and 38 percent under its original budget, surprising even the most committed members of the alliance team. The most remarkable achievement was the installing of the main platform in seven days and switching on production only six weeks later, without a single accident during the whole time. Plateau production of 58,000 barrels per day was rapidly reached with the help of an operating alliance.

This glossy and sumptuously produced book has something for anyone involved in oilfield development. For those interested in finance, there are details of the share of costs, risks and profits between the licensing partners and the alliancing partners. Engineers will savour the solutions that enabled £10 million to be shaved off the bill for pipelines and subsea engineering, for example. This arose partly from re-examining the subsea structures and their protective frames to rationalise design and reduce weight and partly from the alliancing culture itself. Statisticians can garner all the facts about the field from appendices.

In this thorough account, Terry Knott is careful to give every project manager his quote — one can only hope that those who were in BP then are still there now. The company appears to have spent a fair slice of the money saved on the project on the photography and production of the book. It has also exported alliancing not only west of Shetland but also to Alaska and Indonesia, in readiness for the time when in the North Sea it is 'No business — as usual', a time that will surely be delayed by the method used to bring Andrew onstream.

Judith Mirzoeff



Installing Andrew's integrated deck

Vertical cable seismic — the complete picture

Vertical cable seismic (VCS) technology, a new seismic data acquisition technique recently developed by Texaco and outsourced to 3D seismics specialist Petroleum Geo-Services (PGS), proved its worth during early experimental implementation late last year by identifying new reserves in the Strathspey field in the North Sea and providing data that led to the discovery of the Gemini field in the Gulf of Mexico.

VCS versus conventional

The primary difference between a conventional survey and the new vertical cable technique lies in the way that the hydrophones are deployed. In the conventional method, the hydrophones are attached to long streamers which are pulled behind the seismic acquisition vessel horizontally. The vessel also pulls the high-pressure air gun seismic energy sources, which periodically send pulses of compressed energy through the water and into the seabed.

In a vertical cable survey, however, the hydrophones are attached to cables which are located vertically at specific locations on the sea floor with a heavy anchor at one end and a strong buoy at the other. The seismic acquisition vessel fires high-pressure air guns in a large pattern above and around the cables. The cables are then redeployed to another location and another swath of data acquired. This technique provides a continuous data recording operation.

The new seismic acquisition method yields data with higher resolution than that acquired through conventional 3D seismic techniques, according to Sven Havig, PGS Vice President, Business Development. Furthermore, as the data is acquired in a truly three-dimensional sense rather than the conventional series of two-dimensional lines, more complete and accurate analysis of the seismic information is possible.

Indeed, the geometry of VCS shooting makes 3D pre-stack depth migration, a processing technique used to provide very high-quality reservoir images, an affordable option. The geometry of such a shoot allows migration to be run in parallel on all the traces in a hydrophone gather, rather than having to be run on each trace individually. Mr Havig explains: In a VCS survey each

hydrophone gather contains a roughly square area of data in the subsurface. Thus, dip information along all azimuths is included and each gather has all the information necessary to run 3D pre-stack depth migration. In conventional seismic, however, data are acquired in long, narrow strips and each gather contains dip information only in the in-line direction. Thus, for each trace, the computer must sort through the entire set of data collected to find the adjacent traces in the cross-line direction. This greatly increases both computing time and cost.

Strathspey study

PGS first applied VCS technology on a production scale at Texaco's Strathspey field located in the East Shetland Basin some 470 km northeast of Aberdeen. Accurate internal interpretation of the reservoir characteristics below the producing Brent reservoir unit and Statfjord reservoir unit had not been possible previously because the seismic data for the area available at the time was much distorted by high noise levels and strong multiples. However, it was known that significant hydrocarbon volumes were contained below the Brent group in a subtle trap consisting of a foot-wall degradation complex in the nearby Ninian field.

Acquisition began in July 1995 and was completed in June this year. The survey comprised 72 vertical cable positions covering some 35km². A total of 17 vertical cable arrays were used to provide continuous data acquisition. Some 300,000 shot points were fired in the survey. Because VCS surveys can be run virtually independently of weather conditions, as the hydrophones remain stationary in the quieter environment found deep in the sea, the Strathspey survey experienced fewer delays than would have been expected with a

conventional survey in the often extreme weather conditions of the North Sea.

As already mentioned, use of VCS made 3D pre-stack migration an affordable option for the Strathspey data. To give an indication of the costs involved, the cost estimate for running 3D pre-stack depth migration on a conventional dataset with the same number of traces as the Strathspey VCS is approximately \$10 million, whereas the estimate for the entire processing sequence on the VCS was \$1 million.

Early interpretation of data of the eastern flank of Strathspey has provided clear imaging of the steeply dipping events with the scarps, reports Mr Havig. Continuity and signal-to-noise ratio in the deeper section, both on strong events and in areas of weaker reflections, are also significantly better than found with previous data.

The Strathspey survey has not only

produced a wealth of quality seismic data; it has also pointed the way for honing the VCS technique. It has been discovered, for example, that cable locations should be staggered from swath to swath in the in-line direction and that extremely rough weather on the other hand can cause the cables to move from their original location.

Focus on Fuji

More recently, data have been acquired from a 52-day survey on the Fuji discovery located in Green Canyon block 506, a complex sub-salt play in the deep waters of the Gulf of Mexico. Collected in order to obtain an improved reservoir image, the data volume is currently being processed using pre-stack depth migration and analysed by PGS, Mr Havig reports.

A 48-fold, multi-streamer conven-

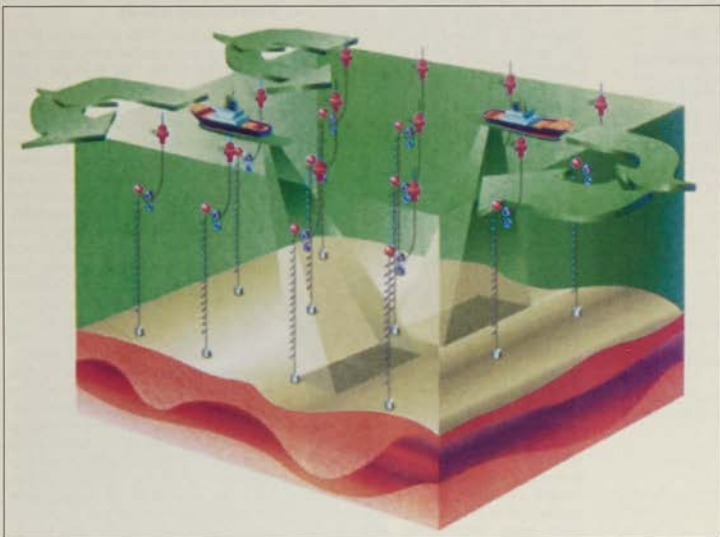
tional 3D survey was conducted as well as a 96-fold VCS 3D survey to allow direct comparison of the pre-stack depth migration volumes produced by each acquisition technique. As already explained, VCS offers a number of advantages over more conventional techniques and it is hoped that this comparison will demonstrate to what extent these advantages are realised in resolving sub-salt plays.

Just the beginning

'Vertical-cable seismic technology is a significant step forward in our ability to more accurately image the subsurface,' says Ronald Robinson, General Manager of Texaco's Houston-based Exploration & Production Technology Department. 'The integration of data acquisition and data processing provides true three-dimensional information faster and cheaper than ever

before and, in doing so, expands opportunities for evaluation of exploration and producing properties.'

Indeed, further applications have already been considered. For example, the VCS technique is also deemed suitable for 4D or time-lapse 3D seismic acquisition for reservoir monitoring. In such cases, however, the vertical cable hydrophones would require very close monitoring to provide the accurate and consistent vertical positioning needed. 'Since cables are easy to deploy and are fully retrievable, this acquisition system provides an economic solution to 4D instrumentation,' comments Mr Havig.



A typical vertical cable seismic survey

Humber Refinery cleans up its waste water

By Carol Reader

Conoco has recently commissioned a new waste water treatment plant at its Humber Refinery in Lincolnshire. While claiming to produce some of the cleanest water possible, refinery staff were reluctant to demonstrate the ultimate test by tasting bottles of the sparkling liquid.

The £15 million plant was officially opened by Michael Brown, MP for Brigg and Cleethorpes, at the end of September. He congratulated Conoco on installing clean-up facilities that enabled the refinery to produce a discharge into the Humber estuary that is cleaner than will be demanded by new effluent discharge limits coming into force next year.

Steve Theede, Chief Executive Officer, Conoco Ltd, said that Conoco was aiming to have the cleanest refinery in Europe. At present he claimed that refinery discharges into the river were 'as clean, if not cleaner' than those of any other refinery in the United Kingdom.

To clean up the refinery discharges at Immingham, a new biological treatment plant has been installed on the

refinery site. This includes an activated sludge unit which uses bacteria to clean up the refinery waste water by digesting the contaminants. These micro-organisms oxidise the organic waste to leave mainly carbon dioxide and water.

The basic process is an established one, used for example at many sewage treatment plants, but here an innovative refinement has been incorporated. A Vitox treatment process, developed by BOC Gases, uses pure oxygen to boost the micro-biological activity, whereas traditional processes use air. The use of pure oxygen allows a higher concentration of bacteria and therefore a faster process. Since no bubbles break the surface in the reactor tanks, this process has the added advantages of reducing offensive odours and emissions as well as containing the production of surplus sludge.

Conoco's new plant can treat up to 10 million litres daily. An equalisation tank and two activated sludge units have been built, each capable of treating the total expected flow from the refinery processes. Here the waste water is biotreated, after oil residues have been separated off and passed over a staircase cascade which reduces the hydraulic energy and strips out carbon dioxide. After biotreatment, the sludge settles in a clarifying process, leaving the effluent to be 'polished' and discharged into the Humber. The sludge containing the bacteria is recycled and re-used; the occasional surplus sludge which is rich in nutrients is taken away by tanker and used as agricultural fertilizer.

The cleaner effluent will enable the refinery to meet strict limits to be imposed from the beginning of next year by the Environment Agency. These relate to the biochemical oxygen demand, ammonia and suspended solids in the effluent when it is discharged into the river. The Environment Agency's new consent limits for the refinery will be much tighter than in the past. Hopefully the same sort of limits will apply to others who discharge their waste along the length of the Humber and its tributaries, not currently known for the purity of their waters.



Aerial view of Conoco's waste water treatment plant at Humber Refinery

Elevated flare emissions measured by remote sensing

By J C Boden,
BP Oil Technology Centre,
K Tjessem,
Statoll and
A G Wotton and
J T M Moncrieff,
Spectrasyn Ltd

Although the flare system normally accounts for only a small proportion of the total fuel burnt at a refinery, estimates of flare atmospheric emissions, including hydrocarbons and NO_x , are increasingly required for air quality and climate-related predictions.

At present, guidelines for estimating emissions from elevated flares are based on measurements made on relatively small test flares.¹⁻⁴ In these published studies, sampling probes were supported above flare tips of 3-12 inches in diameter burning up to 2.9 tonnes/hour of refinery gas¹ or up to 1.5 tonnes/hour of propane or propylene/nitrogen mixtures.^{2,3} Combustion efficiencies were found to be greater than 98 percent under normal operating conditions. The efficiency only fell in heavily smoking flares, or where the flame was on the verge of instability either due to the low calorific value of the fuel or because of an excess of injected steam.

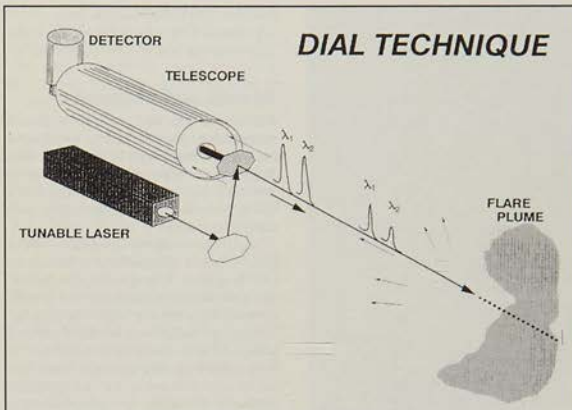
Operational refinery flares are typically much larger, commonly 24 to 48 inches in diameter, burning a wide range of gas compositions, and are subject to higher wind speeds than in the published tests. Until now, extensive emissions measurements on such high level industrial scale flares have not been feasible.

The Differential Absorption Lidar (DIAL) technique, commercially operated by Spectrasyn Limited and originally developed by BP and the UK National Physical Laboratory, offered the possibility of successful remote measurement of flare emissions for what is believed to be the first time.

	Refinery A	Refinery B		Refinery C
		1st Trial	2nd Trial	
Hydrogen	76.1	78.1	49.8	10.8
Methane	8.1	5.6	21.1	5.2
Ethane	7.2	4.2	9.2	7.6
Ethylene	-	0.8	2.1	0.2
Propane	5.7	2.6	5.2	34.6
Propylene	-	0.5	0.6	0.5
iso-Butane	1.7	0.7	-	6.7
n-Butane	-	0.7	4.9	19.0
Butenes	-	0.1	0.1	-
iso-Pentane	0.5	0.4	-	4.4
n-Pentane	-	0.2	2.7	5.4
C ₆₊	-	0.9	1.5	4.9
Hydrogen Sulfide	0.1	0.002	0.8	-
Nitrogen	-	3.9	1.8	0.4
Oxygen	-	0.9	-	-
Carbon monoxide	-	-	-	-
Carbon dioxide	-	-	0.1	0.2
Molecular weight	8.88	8.78	17.2	45.3
Net CV (MJ/kg)	59.8	52.2	49.7	47.8

Table 1: Typical flare gas compositions (volume %)

Figure 1



Four sets of measurements were carried out using the DIAL system at three refineries during 1992-94. The flare tip diameters were 42 and 48 inches and flow rates of refinery gas ranged from 0.9 to 11 tonnes/hour. The hydrogen content of the gas varied from 11 percent to 78 percent and support steam rates were between zero and three times the gas flow by weight. Species measured were methane, mixed C_2 to C_6 , alkanes and nitric oxide (NO).

The DIAL measurements

DIAL is a development of LIDAR, the light analogy of radar. In the single-ended form used here the return signal is back scattered from the normal aerosol present in the atmosphere. The source is a pulsed laser which is tuned alternately on to and off an absorption feature in the known spectrum of a specific gas. Comparison of the energies in the two return signals gives a measure of the content of that gas in the path out from the source to the scattering element and back to the adjacent detector. The return signal is monitored as a function of time after the source pulse, the delay being a measure of the distance to the point of scattering. Thus a concentration

profile of the gas along the laser beam is built up. The range depends on the distance from which the back scatter is detectable and is usually great enough to allow gases in an elevated flare plume to be measured from ground level. The principle is shown in Figure 1.

Methane was chosen as one of the species to be measured because previous work on smaller flares¹⁻³ had shown it to be the largest single component of unburnt hydrocarbon emissions under most circumstances. It is also of interest as a greenhouse gas.

In addition, heavier hydrocarbon emissions were estimated by using an absorption band common to a number of alkanes. This band was selected for previous work on gasoline fugitive emissions, where typically the species detected had a mean carbon number of 4.5. The species balance may be different in flare plume, but the detection sensitivity will remain greatest for C_3 to C_6 alkanes and less for C_2 and for those heavier than C_6 .

The Spectrasyne monitoring vehicle is fitted with parallel ultraviolet and infra-red laser systems, enabling nitric oxide to be measured at the same time as hydrocarbons. NO measurements

were included in two of the test programmes, in order to give an indication of NO_x emissions.

The integrated product of concentration and plume cross-sectional area for these species was determined by scanning the laser beams in a vertical plane intersecting the plume downwind of the flare. To avoid interference from very high temperature gases, the measurement plane was set several flame lengths from the tip. Wind speeds in the tests were such that the plumes were bent over nearly to the horizontal at this point. Therefore the wind velocity could be used to represent the plume velocity. After correction for any angle between the normal to the measurement plane and the wind direction, the mass flux of each species was calculated by multiplying the integrated concentration-area product by the wind speed.

The tests

The flare tips at the three refineries were as follows:

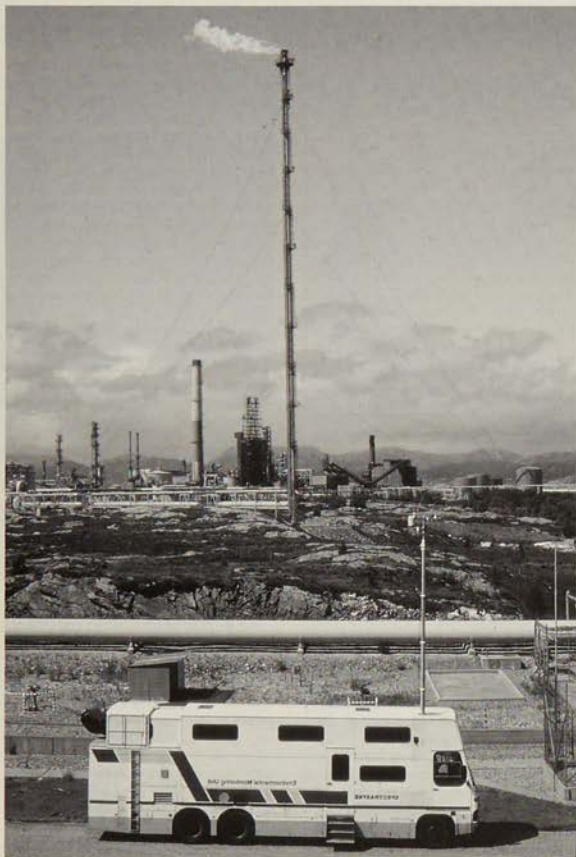
- Refinery A: 42-inch, steam ring plus centre steam
- Refinery B: 48-inch, steam ring with quiet multipoint nozzles
- Refinery C: 42-inch, internal steam/air ducts plus steam ring and centre steam.

The tip elevations were 75 metres, 110 metres and 91 metres respectively.

Mean wind speeds at the flame, computed from measurements at lower levels, were comparable at the three refineries – 2 to 10 metres/second at refinery A, 5 to 17 metres/second and 3 to 10 metres/second for the two trials at refinery B, and 6 to 11 metres/second at refinery C.

Steam flows were directly measured by orifice meters, except at refinery C where they were estimated from variations in the power station output. During the second trial at refinery B, flare gas flows and densities were measured continuously by an ultrasonic flowmeter. For the first trial at refinery B and at refinery C, flare gas flows were estimated from flame lengths, without

DIAL unit measuring flare emissions



support steam, using the correlation in API RP 521⁵ which we have shown to be reasonably reliable for this type of flare; an accuracy of about ± 30 percent is expected. Metered flows from some refinery units provided a check. At refinery A, fuel gas was metered to the flare through an orifice and there

was a small vent flow in addition. Flare gas analyses are given in Table 1.

The emitted fluxes of methane and C_2 to C_6 alkanes were expressed as the percentage which their carbon content represented of the total carbon in the flared gas. They could then be related to com-

bustion efficiency defined as:

$$[1 - (\text{carbon in emitted hydrocarbons, CO, soot}) / (\text{carbon in flare gas})] \times 100\%$$

Results and discussion

Methane and C_2 to C_6 alkane emissions are plotted against steam to gas weight ratio for all these tests in Figures 2 and 3. Each point represents the average of normally two to four complete scans taken with flare conditions held as constant as possible.

Significant scatter is evident in the data. This is primarily attributed to the fact that the species concentrations were relatively close to the limit of sensitivity of the detection equipment but fluctuations in the flare and wind conditions and difficulties in flow metering also played a part. The data are believed to be reliable enough, however, for useful conclusions to be drawn.

Steam to gas ratio was used for the plots because it appears to be the major determining factor. Other variables are likely to contribute but statistical analysis of all the data showed no good correlations. The dashed lines do not represent any particular correlation and have been added to the plots primarily for clarity.

For the second test at refinery B a lack of atmospheric aerosol meant that the limit of detection for hydrocarbons was somewhat higher than usual and the data showed wide scatter. No trends were apparent but the average of all the data from this test has been plotted at the averaged steam to gas ratio to show that the emissions were of the same order of magnitude as in the first test at the same refinery.

The most significant conclusion is that under all these conditions the total hydrocarbon emissions measured amounted to less than 0.4 percent of the carbon in the flare gas for two of the flares and less than 0.7 percent for the other flare. Methane alone represented less than 0.4 percent.

There will be other products of incomplete combustion in the plume, mainly unsaturated hydrocarbons, carbon monoxide and, for the low steam

tests, soot. In the published work on small flares, methane represented 30-90 percent of the total hydrocarbons.² The only exceptions were when the flame was partially quenched due to excessive steam or was diluted by inerts, conditions not encountered in the present trials. Carbon monoxide emissions from high thermal energy flare gases at normal rates were either minor compared with hydrocarbons³ or comparable.² Soot was less than 0.5 percent of the carbon in the flare gas except in heavily smoking flames.^{3,2}

In the present tests, none of the flames smoked more than very lightly. Therefore, on the reasonable assumption that the plume compositions were similar to those published for smaller scale flares, the results imply overall combustion efficiencies of greater than 98 percent.

In spite of the scatter in the data, there is some evidence that methane emissions rose with increasing steam to gas ratio (Figure 2) and that C_2 to C_6 alkane emissions fell (Figure 3), the sum of these emissions varying only slightly. The explanation may be that the flames with higher steam to gas ratios have faster turbulent mixing and are hotter, resulting in more pyrolysis of heavier hydrocarbons to methane.

On the other hand, for a particular flare, the emissions appeared relatively insensitive to the gas flow rate within the range of these data and also to the hydrogen content of the flare gas (Table 1).

That flare design and/or size can have an effect is indicated by the emissions from the flare at refinery B, which over two separate trials were consistently higher than from the other two flares.

Nitric oxide emissions were measured at two refineries and showed wide scatter, in common with published data on smaller flares.² However, there was some relatively weak evidence of an increase with steam to gas ratio at refinery B (Figure 4), possibly suggesting a dominance of temperature over residence time effects in the NO mechanism. Statistical analysis suggests an additional, not very reliable, negative

Figure 2: Methane emissions

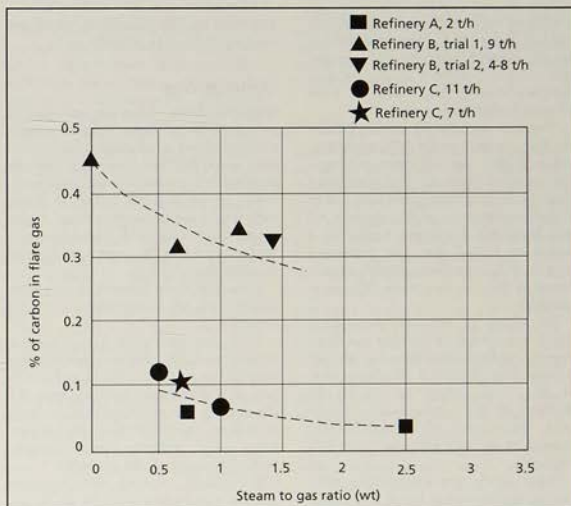
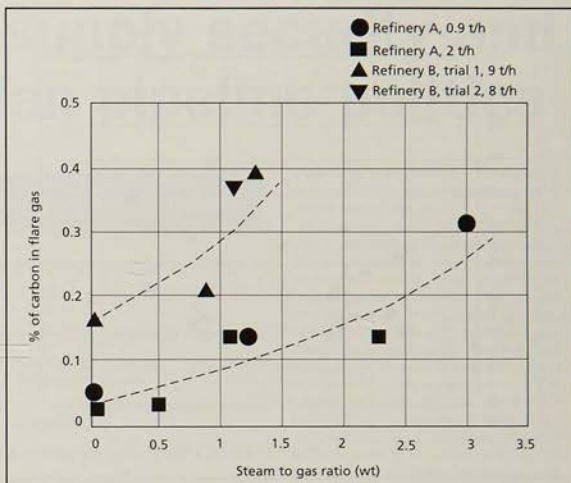
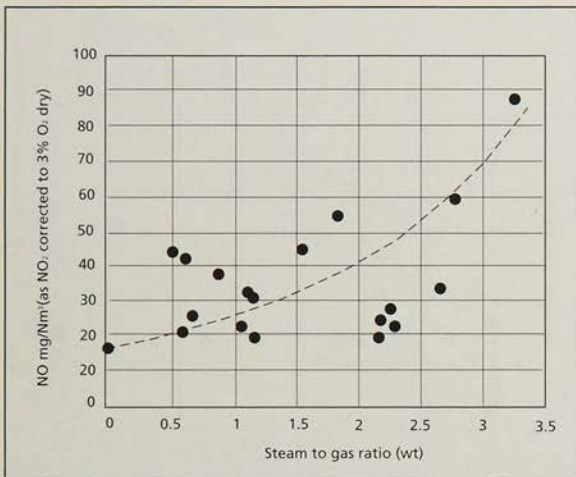


Figure 3: C_2 to C_6 alkane emissions

Figure 4: NO_x emissions at refinery B, trial 2



correlation with steam flow.

NO was measured as a mass ratio to the fuel burnt but for Figure 4 this has been converted to mg/Nm³ of flue gas, at a nominal 3 percent O₂ dry, for easy comparison with NO_x emissions from refinery boilers and heaters.

The data are quoted as NO₂ following the convention for NO_x emissions, although NO₂ was not measured here. The rapid dilution of the post-flame gases by air in a flare could give rise to a higher proportion of NO₂ in the total NO_x than the 5 percent typical of a heater or boiler. However, published data on NO_x from flares provide no evidence as they do not show NO₂ separately.^{1,2}

The range of NO emissions measured was similar to that for gas-fired low NO_x refinery burners. At refinery B it was from 0.21 to 1.18 g/kg of fuel as NO₂ (equivalent to 16 to 88 mg/Nm³ as NO_x, corrected to 3 percent oxygen, dry). At refinery C it was from 0.29 to 1.45 g/kg (ie 22 to 108 mg/Nm³).

These levels are comparable with (averaging somewhat lower than) published NO_x data for smaller flares of

~110 mg/Nm³ and 29 to 150 mg/Nm³, and with US EPA guidelines, which are equivalent to ~116 mg/Nm³.^{1,2,6}

Conclusions

Emissions from full-scale operational refinery elevated flares have been measured for what is believed to be the first time, using the DIAL laser-based remote atmospheric measurement technique. Flares of 42 and 48 inches at three refineries have been monitored at gas rates from 0.9 to 11 t/h, hydrogen contents from 11 to 78 percent and steam to gas ratios of 0 to 3.

Although there is significant scatter in the data, useful conclusions can be drawn.

Total methane and C₂-C₆ alkane emissions represented less than 0.4 percent of the carbon in the flared gas at two of the refineries and less than 0.7 percent at the third, consistent with published measurements on smaller flares which indicate overall combustion efficiencies of >98 percent.

The results suggest that methane emissions increased with steam to gas ratio, whereas the heavier alkane emis-

sions decreased, the combined total varying little.

For a particular flare, hydrocarbon emissions expressed as a percentage of flare gas carbon, appeared relatively insensitive to the gas flow rate within the range of these data and also to the hydrogen content of the flare gas. They were, however, influenced by flare design and/or size, being consistently higher at one refinery than at the other two.

NO emissions were similar to those from gas-fired low NO_x refinery burners and showed some evidence of an increase with steam to gas ratio. The levels were similar to or lower than previous measurements on smaller flares.

Acknowledgments

The cooperation of the refinery staff of Preem Petroleum, Gothenburg (Sweden), Statoil, Mongstad (Norway) and BP Oil is gratefully acknowledged.

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Petroleum supply security and Central Asian pipeline politics

Two of the three authors of the recent Trilateral Commission study, *Managing Energy Security in a Global Context*, discussed 'The Three Faces of Energy Security' in September at a seminar that was part of the Johns Hopkins University School of Advanced International Studies' Energy and Environment Program. William F Martin, formerly Special Assistant to President Ronald Reagan and US Deputy Energy Secretary, and Helga Steeg, formerly Executive Director, International Energy Agency (IEA), perceptively analysed the economic, security and environmental implications of the world's growing demand for energy, particularly oil, and its increasing dependence on Middle East sources of supply.

By Peter S Adam

Bolstering energy security

The study's policy recommendations included:

- bringing China and India into the IEA
- building up emergency petroleum reserves worldwide
- enhancing IEA cooperation and coordination
- studying pipeline security
- establishing a G7 entity to keep tabs on the Gulf.

These are all generally sound. But it is uncertain whether such measures will ever be implemented, at least to the extent they should be in order to be effective. Coordinated action along the lines the trilateralists propose may prove far more difficult to carry out, both in the realm of energy and international policy more generally, than their *Three Faces* study (co-authored by Ryukichi Imai, Distinguished Research Fellow at Tokyo's Institute of International Policy Studies, who was not present at the seminar) would lead one to believe, for reasons the authors touched on but did not, in either their report or presentation, explore fully.

This is unfortunate but understandable. Energy policy debates can be contentious. In the United States they are likely to become increasingly so, as international supply/demand balances tighten worldwide, the price of oil strengthens and the perplexing messiness of the post-Cold War world asserts itself in the realm of energy security, and more generally in all international policy matters. The authors, who want

their recommendations implemented, may well feel that discretion here is the better part of valour.

The enmity and political infighting that policy debates can stir up was far more evident in two subsequent gatherings, also held in Washington (one sponsored by the Center for Strategic and International Studies, (CSIS) and the other at Johns Hopkins Central Asia Institute), covering contiguous ground — the development of Central Asian states' oil and gas resources. Those speaking on Azerbaijan, Kazakhstan, Tajikistan, Turkmenistan and Uzbekistan included Dr James Schlesinger, former US Energy and Defense Secretary, and former National Security Adviser, Zbigniew Brzezinski. While reviewing Central Asia's prospects, they levelled harsh criticism at current US policies towards the region as well as neighbours in the Gulf.

Policies and clichés

Dual containment of Iran and Iraq drew particularly heavy fire from Mr Brzezinski who called the US policy which aims to prevent either Iran or Iraq from dominating the Gulf a 'meaningless cliché'. He went on to state that it was ineffectual and contended that US efforts intended to punish Iran by interfering with its commerce diminished the likelihood that trans-Iranian pipelines and railways would soon be carrying oil and gas from Central Asia to the ocean. This, he reasoned, could well delay the economic and political development of the Central Asian republics and thus pave the way for a resurgent Russia to play spoiler in the region. Mr Brzezinski proposed that the United States should adopt a more receptive attitude to Iran and help speed up development in Central Asia.

(By contrast, the *Three Faces* study called upon Iran to start being less contentious towards the United States.)

Mr Brzezinski predicted that, given their newly discovered nationalism, the countries of Central Asia would successfully resist domination by Russia and become stable and viable, though sometimes at a price — internal security measures that could at times be heavy-handed. He did note, however, that intense rivalries existed between the countries and this would preclude them from banding together to form a strong union. Each country would, he predicted, go its own way but would remain respectful always of Russian interests.

Dr Schlesinger noted that in 1906 a delegation sent by the Institute of Petroleum to report on oil development in Baku reported to London that the region's prolific oil could be developed only if pipelines were built to the sea and peace prevailed among the Tartars. He pointed out that the same holds true today.

The oil weapon

Dr Schlesinger also criticised current US policies that impact on Central Asia and accused the United States of using its position as the world's largest oil importer to wield an 'oil weapon'. He held that restricting the activities of US companies and trying to restrain others, strained relations with allies unnecessarily and placed US firms at a competitive disadvantage vis-a-vis their non-US counterparts.

CSIS analysts Shireen Hunter and Bulent Aliriza then discussed how Turkey, Iran, Russia, China, India and Pakistan, the United States, Japan and Europe are all fiercely vying for influence in Central Asia, a region which was closed off from the rest of the world not only by the Iron Curtain of Soviet Communism but, long before that, by the Islamic iron curtain which fell centuries before Stalin was born.

Of course US companies stand ready to help Kazakhstan, Azerbaijan and Turkmenistan to develop their huge

oil and gas resources and transport them across vast distances through Russia and Afghanistan and, perhaps some day, Iran. Representatives of major US oil companies involved in the region (Amoco, Unocal and Chevron) gave guardedly optimistic

'US companies stand ready to help Kazakhstan, Azerbaijan and Turkmenistan to develop their huge oil and gas resources'

assessments of their pipeline projects and expressed strong support for the one element of current US policy towards the region with which everyone agrees — there must be multiple pipeline routes out, which would preclude any one country, or political entity, from having the power to stop the flow of oil and gas.

The 'aura' of oil

Robert Ebel, CSIS Director, Energy and National Security, brought the region into sharp focus in a review of the plans to develop its energy resources, tied into to geopolitical observations. If fully developed, Central Asia's oil and gas endowment is capable of producing only about 3 percent of the world's supply, roughly the same as the North Sea, he noted. The region cannot displace the Middle East. What draws attention to the area is not energy resources themselves, Mr Ebel stated, but what he termed the 'political aura of oil'. Had the Soviet Union pursued a policy of 'draining Central Asia dry', the region's resources would

be less important than they now are. But under the Soviets, Moscow, for technical and political reasons, developed Western Siberia instead and left Central Asia's hydrocarbons, for the most part, alone. Now the region's resources are a competitive threat to Russia. Given the international interest in the area, it seems Russia's best course would be to allow only limited development of Central Asian oil and gas, enough to keep the region stable and satisfy regional powers and the United States but not enough to undermine prices on world markets or threaten Russia's market share.

Developing Central Asia's oil wealth will not by itself bring stability to the region. The countries could, he observed, fritter their wealth away, leaving them vulnerable to political strife. In any case, Russia will demand and should get a seat at every bargaining table.

Mr Ebel went on to note that a frozen policy towards Iran presents a very real risk of prompting a confrontation between legitimate US commercial interests and foreign policy interests. This could have a detrimental effect on the region and undermine US interests there. At some point, although probably later rather than sooner, Iran and the United States will, Mr Ebel believed, reach an accommodation with Iran. When that happens, pipelines will be built from Central Asia to Iran's coast and development of the region will proceed more rapidly and smoothly.

Politics and policy

When that could happen is difficult to predict. But the day may be coming. Participants at another gathering on Central Asia, the Johns Hopkins International Energy and Environment Program's 'Pipeline Dilemmas in Central Asia: How to Get the Oil to Markets' seemed to ascribe a very different rationale for US policy vis-a-vis Central Asia and the Gulf than their colleagues who spoke at the CSIS programme. Elshan Alekberov and Charles Fairbanks of the Central Asia

Institute pointed out that Senator Alfonse D'Amato, powerful Chairman of the Senate Banking Committee, introduced legislation calling for the imposition of far harsher restrictions on trade with Iran than have been adopted so far. The administration, with the Republicans in control of Capitol Hill, must sail with the prevailing winds, at least until the election. Thereafter, who knows?

So it would appear that current US policy on Central Asia is an adjunct to the US policy in the Gulf, which in turn is determined, to a great extent, not by commercial considerations, international realpolitik, or geopolitical balances, but by US domestic political factors. This is not the best environment in which to make policy. A great deal is at stake, – not just oil and gas, and not just in Central Asia.

The stakes in the great game

Mr Ebel noted in his discourse that the political and economic rivalry of the Cold War has been supplanted by commercial rivalry of the post Cold War world. Competition for markets might undermine the attempts to co-ordinate energy policies such as those recommended by the authors of the report on energy security made to the Trilateral

Commission, now that world communism has been defeated. On another disquieting note, Mr Ebel wondered what role will countries' intelligence gathering apparatus, which served the free world so well in defeating the Soviet Union, play in all this?

'Developing Central Asia's oil wealth will not by itself bring stability to the region'

This sounds like a new twist on the 19th century's 'Great Game' of the British Empire, which turned on control of Central Asia.

It is interesting to note that 1906 was the year in which, as Dr Schlesinger reported, the Institute of Petroleum sent a delegation to Baku to investigate Central Asia's oil and gas. Theodore Roosevelt was US President then. And the intense nationalism and regional focus that his style of engage-

ment with the world emphasised stands in sharp contrast with the internationally oriented approach, reliant on extensive alliances and co-operative efforts, that the United States has followed ever since.

Resolution of Central Asia's pipeline problems and associated matters may reveal whether the cooperative approach, which is implied in the policy recommendations the authors of the *Three Faces* report put forth, will resonate internationally and continue to suffice, in the area of energy security, as well as in other realms of international interaction generally, now that the Cold War is history.

In a perceptive analysis of the region, 'Russia's Battle for Central Asia' that appeared recently in *The Wall Street Journal*, Nancy DeWolf Smith of the *Asia Wall Street Journal* wrote, 'The history of this century has been marked above all by a resistance to the emergence of a single power in Europe. At the beginning of the next century, it may be Central Asia that becomes the central focus of world economic, political and military conflict.'

As the region evolves, will the United States emphasise international policy co-operation and co-ordination or, as Theodore Roosevelt advised, 'Speak softly and carry a big stick.'



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Impact of VOC emission controls on rail loading operations

By C A Holt
Technical Services
Department,
Lindsey Oil Refinery

A detailed study to assess the impact of the EU Directive (94/63) 'on the control of volatile organic compound (VOC) emissions resulting from the storage of petrol and its distribution from terminals to service stations' (otherwise known as the Stage 1 Directive) was commissioned last year by Total Oil GB and Fina plc which distribute petrol by rail from the jointly owned Lindsey Oil Refinery in Lincolnshire to a number of strategic storage and distribution terminals throughout the United Kingdom. As loading operators determined to maintain an efficient loading programme, both companies were concerned at the effect the required VOC emission control methods would have.

Analysis of loading emissions

Following the study, the Rail Loading Group within the European Petroleum Industry Association (EUROPIA) has recently approved a technical paper outlining estimated average VOC emissions during the top loading of rail tankers. The protocol was produced jointly by Shell International Oil Products and Lindsey Oil Refinery Ltd.

The loading cycle considered comprises:

- 1 Opening the top loading hatch prior to positioning the rail tanker in the loading station
- 2 Awaiting completion of the rail tanker currently loading and then travel to the loading station
- 3 Loading operation whereby product is delivered through a remotely operated hydraulic lance
- 4 Travelling from loading station to allow the next rail tanker to be positioned. When at rest the top hatch is closed.

Figure 1 details the estimated emissions for the loading operations briefly described above. An overall figure of 0.0635 percent weight of emissions/weight of product loaded (wt/wt) compares well with the UK industry accounting 'norm' of 0.06 percent wt/wt without vapour collection.

In order to comply with the Stage 1 Directive, it is necessary to capture vapours displaced during loading and to treat them in a vapour recovery unit. However, companies which load rail tankers have already dedicated significant resources and experience to ensure that they operate a safe and efficient loading system. This makes retrofitting rather than replacement an attractive option for com-

pliance with VOC control legislation.

Figure 2 presents the estimate for VOC emissions with vapour collection and recovery. The two main sources of emissions are from the vapour recovery unit and from the rail tanker hatch before it is closed after loading. The overall emission figure of 0.0042 percent is lower than the target reference value in the Stage 1 Directive — 0.005 percent wt/wt. The Directive specifically states that this target reference value is not a limit against which the performance of individual terminals will be measured.

Throughout Europe the vast majority of rail tankers deliver petrol to secondary distribution terminals. The rail tankers are top-filled and bottom discharged, drawing in air through auto vent valves during the discharge process to replace the volume of product pumped into storage. At large terminals where petrol is stored in floating roof tanks, these tanks have to be fitted with primary and secondary seal systems designed to meet stringent performance requirements. The Directive's limits on VOC emissions from floating roof tanks are comparable to fixed roof tanks connected to a vapour recovery unit.

Where terminals have fixed roof tanks, they must be connected to a vapour recovery unit; otherwise internal floating decks fitted with primary seals must be installed. A derogation does exist for smaller terminals with less than 25,000 tonnes/year gasoline throughput that have fixed roof tanks. They can opt for intermediate storage of vapours in preference to immediate vapour recovery.

Intermediate storage of vapour, otherwise known as vapour balancing, involves the return of vapour to the rail tanker as it is displaced during the filling of the fixed roof tank, thereby replacing product volume as the rail tanker is emptied. For rail tankers vapour balancing is only required where intermediate storage of vapours is undertaken. Vapour balancing is unlikely to be adopted in the United Kingdom but it has been in parts of Europe. It requires supply using a rail fleet equipped with vapour return pipework.

Preventing the release of VOCs when the top loading hatch of a rail tanker is first opened has been the subject of much debate. This control is known as

'depressurisation' as the evaporation of any product left in the rail tanker and any increase in vapour temperature due to solar radiation will cause the pressure in the rail tanker to rise above atmospheric prior to the hatch being opened for loading.

However, comparison of Figures 2 and 3 shows that the level of VOC emissions only becomes significant when the rail tanker has been subjected to a vapour balancing operation at the last delivery point. Where there is no vapour balancing, the average emissions during loading, including the 'depressurisation' emissions, are well within the target reference value of 0.005 percent wt/wt.

But, if vapour balancing is carried out, the target reference value of 0.005 percent wt/wt cannot be met without adding new constraints to the loading operation and recovery processes, including the need to capture the emissions during depressurisation (see Figure 3).

Draft CEN standard

The European Committee for Standardisation (CEN) has circulated a draft document drawn up by the Technical Committee CEN/TC 256 on Railway Applications. The document, concerning devices for bottom emptying and top filling of liquid products, conveys a mandatory requirement for petroleum rail tankers to be fitted with a depressurisation device which can be linked into the vapour capture system. Also mandatory is the envelope of dimensions given for the location of the device. If this draft document becomes a European Standard, CEN members, including the United Kingdom, are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a National Standard without any alteration.

However, in terms of VOC control, a vapour depressurisation device is only necessary where the rail tanker is involved in vapour balancing operations. Those involved are therefore querying why they should be required to fit a device that is not necessary for many operations throughout Europe and probably not needed at all in the United Kingdom.

Figure 1: Emissions without vapour collection/recovery (no vapour balancing)

	%wt/wt
Emissions on opening top hatch (depressurisation)	0.0008
Emissions whilst hatch open before loading	0.0005
Emissions during loading	0.0610
Emissions whilst hatch open after loading	0.0012
Total emissions	0.0635

Figure 2: Emissions with vapour collection/recovery (no vapour balancing)

	%wt/wt
Emissions on opening top hatch (depressurisation)	0.0008
Emissions whilst hatch open before loading	0.0005
Emissions from vapour collection system	0.0006
Emissions whilst hatch open after loading	0.0011
Emissions from vapour recovery unit	0.0012
Total emissions	0.0042

Figure 3: Emissions with vapour collection/recovery (with vapour balancing)

	%wt/wt
Emissions on opening top hatch (depressurisation)	0.0037
Emissions whilst hatch open before loading	0.0027
Emissions from vapour collection system	0.0012
Emissions whilst hatch open after loading	0.0011
Emissions from vapour recovery unit	0.0024
Total emissions	0.0111

One concern is that over-pressure caused by a rail tanker standing in the sun can make the top hatch open rapidly which may result in injury to loading personnel. However, there are modern manlid designs using staged opening already available to prevent this (for example 'Progressive' type manlids in the United Kingdom).

A compromise should be found for this CEN document based on the premise that 'If a rail tanker is to be equipped with a depressurisation vapour device... its specification will be...'. This would not then contradict the petroleum industry advice that the collection of vapours during depressurisation prior to loading should only be required if vapour balancing during the discharge of product at terminals or service stations has been carried out.

In addition, where a depressurisation vapour device is fitted, the location envelope proposed in the draft CEN standard may not be suitable. Lindsey Oil Refinery is not alone in Europe in that the dimensions of the existing loading station

equipment prevent immediate access to the top hatch. This means that the device could not be used within the loading station prior to loading. Depressurisation would have to be undertaken away from the loading station requiring further safety interlocks and a breakaway coupling. The UK rail gauge leaves very little space for manoeuvre. To permit safe operation, therefore, the oil industry needs to propose an alternative location envelope to CEN, based on the practicalities associated with existing loading facilities.

In conclusion, it is considered that the current draft standards from CEN/TC 256 require amendment on the issue of the depressurisation device. Firstly, the proposed location envelope will cause safety problems in the United Kingdom. Secondly, for those rail supply networks (such as expected in the United Kingdom) where vapour balancing during discharge will not be undertaken, the emissions during depressurisation are small and a depressurisation device is not required to ensure compliance with the Stage 1 Directive.

Revival of exploration activities in Jordan

By Dr Naji Abi-Aad
Energy Consultant

The government in Amman has led an aggressive campaign to revive exploration in the kingdom by offering production-sharing agreements with attractive terms. This has resulted in the signature of two new exploration and production-sharing agreements with foreign oil companies earlier this year, while a letter of intent with a third company is about to be finalised and a gas exploration and development agreement is under negotiation. That followed the establishment of a Jordanian national oil company, the National Petroleum Co (NPC), which took over the upstream operations of the Natural Resources Authority (NRA).

In late 1994 the Jordanian government formally approved the establishment of the National Petroleum Company (NPC) as one division of the National Resources Authority (NRA), focusing on petroleum activities. The second NRA division, the Petroleum Department, was put in charge of regulatory and supervisory functions, including the representation of the government in all petroleum-related agreements. Between the establishment of the NRA in 1966 and the end of 1995 when the NPC overtook the Authority's petroleum activities and assets (including its five drilling rigs), the NRA had acquired 33,000-line km of seismic profiles and had drilled around 100 wells, of which 59 were development wells.

The NPC was officially incorporated in July last year as a joint stock company with a capital of \$13.5 million that is 75 percent owned by the Jordan Investment Authority (JIA), representing the petroleum assets of the NRA, and 25 percent by subscriptions of capital from the JIA and other state agencies. Five months later, the Jordanian Ministry of Energy and Minerals awarded the NPC a 50-year exploration and production concession covering the Hamza and Risha regions — where the kingdom's single oil and gas fields are respectively located. The renewable agreement allows the NPC to compulsorily purchase all land needed for its activities and to utilise existing infrastructure. It also provides for any oil and gas that the company may discover to be shared with the state.

Meanwhile, the government announced that exploration and production-sharing agreements are now offered to foreign firms in various areas, including the Azraq region, the

Basalt Plateau, the Northern area, the Jordan Rift Valley, the Sirhan region and the Central Plateau, as well as the Southern areas. The production-sharing model agreement published in mid-1995 serves as a general guide for investment and includes fiscal and non-fiscal terms that are negotiable.

The production-sharing model agreement comprises the following fiscal terms:

- In the case of a commercial oil discovery, production-sharing is based on a negotiated percentage cost recovery and a profit oil split with a sliding-scale based on the levels of production. In the case of a natural gas discovery, the cost recovery rate is faster and profit natural gas is split between the NRA and the contractor;
- There are annual payments for the training of NRA professionals and the transfer of technology;
- Corporate income taxes are included in the NRA's profit petroleum;
- There are customs exemptions on all items used for petroleum operations;
- Non-Jordanian contractors are exempt, during the exploration period, from payment of Jordanian income tax or other taxes, royalties or duties derived from carrying out exploration activities.

The non-fiscal terms of the production-sharing agreement include the following:

- An exploration period of seven to eight years, divided into three exploration terms;

- A production period of 25 years, with possible extensions of five years for oil and 10 years for natural gas;
- Relinquishment of parts of the original contract area at the end of each exploration term and the relinquishment of the total area at the end of the exploration period, except those regions designated as production areas;
- Contractors have the right to export all petroleum to which they are entitled and are not required to satisfy domestic consumption requirements;
- Contractors will be paid the current market value, in US dollars, for any petroleum sold for domestic consumption;
- There is no foreign exchange control.

New foreign interest

These attractive terms have enabled the Jordanian authorities to bring in three new foreign oil companies. Two exploration and production-sharing agreements were signed with Anadarko Petroleum Corp and Trans Global Oil.

In March Anadarko finalised an exploration and production-sharing preliminary agreement initialled in September 1995 with the NRA, covering the 16,800-sq km Safawi acreage in the northeast of Jordan near the Iraqi border.

Under the final agreement, the US company is committed to spending \$20 million during an exploration period of eight and a half years, including the drilling of a minimum of six wells. The company will spend at least \$5 million on exploration during the first two and a half year phase of the project.

Anadarko has already announced plans to lease a rig from the NRA to drill two stratigraphic wells late this year aiming to confirm the crude potential of the area. In the case of a commercial discovery, the agreement provides for a production split (after cost recovery) of 65.5 percent to 37.5

percent in favour of the US company.

Following the conclusion of the agreement with Anadarko, Iraq issued a warning to Jordan to suspend exploration activities in the border area between the two countries, arguing that the sloping geological structure stretching from the Anbar district of Iraq towards Jordan provoked a migration of Iraqi oil and gas reserves.

Another exploration and production-sharing agreement was signed in April between the NRA and Trans Global Oil, covering a block of 6,675 sq km located in the Dead Sea region along the borders with Israel and the West Bank. Under the agreement, first initialled in July 1995, the US company undertook to spend \$20 million on exploration, including geophysical and geological studies, a 2-D seismic survey totalling at least 159-line km of profiles and the drilling of at least two wells over an initial period of four years – one well during the following two-year period and another well during an additional optional two-year extension. The production-sharing formula between the NRA and Trans Global will be decided upon later.

Interest from Malaysia

Meanwhile, Petronas has been negotiating with the NRA to finalise an exploration and production-sharing memorandum of understanding initialled in July 1995 covering the eastern area of Sirhan, with the hope to start its exploration activity shortly. The Malaysian company had already conducted a preliminary study of the region's hydrocarbon potential based on geological and geophysical data sup-

plied by the NRA.

At the same time Amoco has been discussing with the NPC the terms and conditions of a contract, under which it will carry out exploration and development work on a 8,000-sq km area in the Risha region. Amoco had already carried out five geophysical surveys, the results of which had indicated 'the presence of natural gas in commercially exploitable quantities.' The US company has put forward a two-year programme for working over six Risha wells currently producing about 30 million cubic feet/day of gas, as well as 24 old, non-producing wells, through the use of the hydraulic fracturing method and for hooking up three other producing wells. Amoco is planning to spend \$6.8 million if gas is discovered and to carry out an \$8-million in-depth study on the crude oil potential of the area.

The Risha gas field, Jordan's single gas producing structure, was discovered in 1987 by the NRA with the technical and financial assistance of Petro-Canada International Assistance Corp. The output, currently about 35 million cubic feet/day from a sustainable capacity of 51 million cubic feet/day, is utilised to fuel a 120-MW power plant located nearby that generates 17 percent of the country's electricity. The remaining natural gas reserves of the field are currently estimated at around 530 billion cubic feet.

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Publications

Hydraulic Fluids

Peter Hodges (Arnold, 338 Euston Road, London NW1 3BH. Available from Bookpoint Limited, 39 Milton Park, Abingdon, Oxon OX14 4TD) 167 pages. ISBN 0 340 67652 3. Price: £40.00.

Written by an IP fellow, this text reviews the development of modern hydraulic fluids including recent advances in synthetic oils, which will inevitably become more dominant as natural products become more scarce. It discusses the application and selection of hydraulic fluids through the investigation of their physical and chemical properties and relates this to operational requirements. The book also provides guidance on suitable maintenance routines.

Environmental Control in Petroleum Engineering

John C Reis (Gulf Publishing Company, Book Division, PO Box 2608, Houston, Texas 77252-2608, USA) 288 pages. ISBN 0 88415 273 1. Price: \$65.00.

This book shows engineers how to reduce and control the environmental consequences of producing and processing petroleum and natural gas. Particular emphasis is placed on prevention, as the best way to treat pollution is to avoid creating it in the first place. Remedial technologies are also addressed for those sites already contaminated with petroleum wastes. Appendices cover the latest US federal environmental regulations, sensitive habitats, major US chemical waste exchanges and offshore releases of oil.

The Almanac of Russian Petroleum 1996

(PIW Publications, 4th Floor, 575 Broadway, New York, NY 10012, USA) 150 pages. Price (paperback): \$595.00 (PIW subscriber), \$785.00 (non-PIW subscriber).

This publication provides a comprehensive, up-to-date profile of the Russian oil and natural gas industry. It includes detailed statistics on oil exploration, drilling, production, transportation, refining and export activities as well as individual profiles on the activities of the 13 integrated oil companies, over 30 oil-production associations and 24 refiners. The information is also available on diskette.

Titanium Alloys in Subsea and Offshore Production Systems

(The Marine Technology Directorate, 19 Buckingham Street, London WC2N 6EP) 88 pages. ISBN 1 870553 25 X. Price (paperback): £65.00.

Titanium and its alloys are making inroads into the offshore market, a notable example being its consideration for catenary production risers in deep water. This report, originating from a survey of nearly 50 oil companies, assesses the industry's attitude to the current and potential use of titanium in offshore applications and aims to identify whether any uncertainties about its use can be sensibly addressed by research and development work.

Storage Tanks: Advances in Environmental Control Technology Series

Editor: Paul N. Cheremisinoff (Gulf Publishing Company, Book Division, PO Box 2608, Houston, Texas 77252-2608, USA) 304 pages. ISBN 0 87201 332 4. Price: \$89.00.

This text is designed to help engineers identify and assess storage tank problems. It examines the technical issues and the regulatory requirements for storage tank use, replacement and remediation as well as outlining tank farm specifications and various tank construction methods. A chapter is also devoted to techniques for minimising ecological damage during the clean-up of oil spills.

Storage Tanks ASTs & USTs

Editors: D E Krause and J A Lehmann (NACE International, PO Box 218340, Houston, Texas 77218-8340, USA) 370 pages. ISBN 1 877914 94 0. Price (paperback): \$35.00 (NACE members), \$47.00 (non-NACE members).

Storage tank failure and ground contamination are two major problems which can face storage tank owners and operators. As government concern for public safety increases, so does the pressure on operators to implement the necessary changes to satisfy the new regulations within a specific time-frame. This publication is a compilation of papers presented at the NACE Storage Tank Conference held in Houston, Texas in January. Topics covered include corrosion, leak detection and prevention, contingency planning, emergency response, asset preservation, design, construction and maintenance as well as pending legislation on above-ground storage tanks and prospective legislation.

Feedstocks in World Petroleum Markets

(PIW Publications, 4th Floor, 575 Broadway, New York, NY 10012, USA) 90 pages. Price (paperback): \$445.00 (PIW subscribers, Starsupply clients), \$555.00 (non-PIW subscribers).

This report, produced jointly by PIW and oil brokers Starsupply Petroleum Feedstocks, provides an in-depth examination of the increasingly important role that intermediate feedstocks are playing in refining profitability and the structure of oil markets. It includes detailed descriptions of the global markets in naphtha (both paraffinic and N+A), vacuum gas oil and straight-run residues; breakdowns of key trade flows; discussions of the regional variations in feedstocks pricing; an assessment of the growing scarcity of key feedstocks, data on both feedstock prices and trade flows; and a look at the impact of environmental regulations. The report also contains a four-page glossary of technical terms.

The Future of Refining in Europe — the view from 2010

(Institute of Petroleum, 61 New Cavendish Street, London W1M 8AR) 12 pages. Price: £12.00 (no discount for IP members)

This report summarises the conclusions of an IP workshop on scenario planning for the refining industry, which looked ahead as far as 2010. This small private workshop, held in January with senior management participation, drew up three scenarios, none of which forecast an easy future for the industry. However, they did outline some possible strategies. For the years 1996-2010, the workshop offered three scenarios — 'muddle through,' 'hard grind' and 'refining reinvented.'

The Geological Interpretation of Well Logs

Malcolm Rider (Whittles Publishing Services, Roseleigh House, Harbour Road, Latheronwheel, Caithness KW5 6DW) 280 pages. ISBN 1 870325 36 2. Price (paperback): £35.00.

Now in its second edition, this publication discusses and illustrates the interpretation of well logs for geological ends. The book is illustrated with a number of real examples and combines both well established and new developments in this field. The principal open hole logging tools are considered from theory to data acquisition and interpretation. New versions of old tools are also covered as are the newly developed techniques of image logging and dipmeter. The use of log data in subsurface sequence stratigraphy is also discussed.

People

Chevron has announced that **Mr Ray Galvin**, a corporation Vice President and President of Chevron USA Production Co, will retire at the end of February 1997. He will be replaced by **Mr Peter Robertson** who is currently the corporation's Vice President of Strategic Planning and Quality. **Mr Greg Matiuk** has been elected a corporate Vice President to replace Mr Robertson.

Union Texas Petroleum Holdings Inc has announced that **Mr John E Kennedy** has been named Managing Director of Union Texas Petroleum Ltd, its wholly owned subsidiary based in London. He replaces **Mr John WJ Hardy**, who becomes General Manager, Upstream Opportunities, for the company's Asia Pacific regional business unit.

Ethyl Corp has appointed **Dr Alexander McLean** as Vice President, Petroleum Additives. Dr McLean moves to his new post from the position of Director, Strategic Planning. He will now have responsibility for worldwide sales of additives and R & D.



Mr Roland Bridges has been appointed Vice President UK of Spars International, the J Ray McDermott/Aker Oil and Gas Technology joint venture. In his new role with the company he will be responsible for marketing the spar concepts in the United Kingdom and will be based at McDermott's offices in Wembley.



Dr Pierre Jungels CBE is to be appointed Chief Executive of Enterprise Oil. Dr Jungels, who will take up his new appointment next January, is currently Managing Director, Exploration and Production, British Gas. **Mr Graham Hearne** will continue as Chairman and **Mr Mike Pink**, IP Vice President, will retire as Group Managing Director. Dr Jungels is also a previous President of the Institute of Petroleum.

Seaford Resources plc has announced that **Mr David Keith**, currently Managing Director, will succeed **Mr John Raitt** as Chief Executive Officer. Mr Raitt will continue as Chairman of the company and will remain actively involved in exploration and corporate strategy.

Ms Juli Salvi has been appointed E90 Project Manager for ICL Edacem. Ms Salvi will be responsible for client liaison, product customisation and the successful installation of the new E90 Windows NT-based petrol automation system across the United Kingdom.

Whesoe Varec has appointed **Ms Chris Jones** to the post of regional sales director. Ms Jones will take on responsibility for all the company's distribution channels and direct sales operations in parts of Europe, the Middle East and Africa. She joins Whesoe Varec from a management consultancy post at ERC executive search company.

Mr Enrique Locutura, currently Vice-President of Repsol Comercial de Productos Petroliferos has been appointed Managing Director of Repsol Quimica. **Mr Jorge Segrelles Garcia** will take on responsibility for Marketing and the Service Station Network and will continue in his role as Director of External Relations for Repsol SA. **Mr Pascal Olmos**, presently General Manager of Direct Sales for Repsol Comercial de Productos Petroliferos, will be responsible for overall group sales.

The UK Offshore Operators Association (UKOOA) has announced the appointment of **Dr John Wils** as the new Director of its Aberdeen office. He replaces **Dr John McKinnell** who, after four years in the post, has decided to retire.

Dr Roger Cairns, Managing Director of Hardy Oil & Gas plc, is to take early retirement. This will be effective from 30 April next year.



Mr Hamish Dingwall has been appointed as Head of Energy at Scottish Enterprise in Aberdeen. Mr Dingwall joined the Oil and Gas Division of Scottish Enterprise's predecessor, the Scottish Development Agency, in 1990, progressing to his most recent position as Head of Oil and Gas in 1995. His new role includes responsibility for power generation and renewable energy in the whole of Scotland.



Wood Group Engineering has made two new appointments to its management team in Aberdeen. **Mr Derek Blackwood** (above), formerly Managing Director of APG/Salamis JV Ltd, has been appointed as Managing Director for Integrated Services. **Mr Chris Walsh** (below), a Project Manager, joins the company from a business development role at APG/Salamis JV Ltd as General Manager, responsible for all Shell contracts.



British Gas Energy, the planned domestic gas supply arm, has made two senior appointments. Financial controller **Mr Mark Clare** has been appointed Finance Director Designate and **Mr Simon Lewis**, Director of Corporate Affairs at NatWest Group, joined in September to fulfil a similar role.

Great Western Resources has announced the appointment of **Mr William H Flores** as non-executive Director of the company. Mr Flores presently serves as Senior Vice President, Chief Operating Officer, Chief Financial Officer and Director of Marine Drilling Companies Inc.

Forthcoming Events

November

2nd-6th

Muscat: 'Improved Bulk Liquid Measurement'. Details: Abacus International, 214 Inchbonnie Road, South Woodham Ferrers, Essex CM3 5WU. Tel: 01245 328340 Fax: 01245 323429

4th-5th

Sweden: 'Transmission & Trading in Nordic Power'. Details: Rachel Denning, SMI Ltd, No 1, New Concordia Wharf, Mill Street, London SE1 2BB. Tel: 0171 252 2222 Fax: 0171 252 2272

5th-7th

Jakarta: 'Asme Turbo Asia '96'. Details: International Gas Turbine Institute, The American Society of Mechanical Engineers, PO Box 422029, Atlanta, GA 30342 USA. Tel: +1 404 847 0072 Fax: +1 404 847 0151

6th-8th

Oxford: 'Understanding the International Petrochemicals Business'. Details: The College of Petroleum and Energy Studies, Sun Alliance House, New Inn Hall Street, Oxford OX1 2QD. Tel: 01865 250521 Fax: 01865 791474

7th

Birmingham: 'Fuel Measurement and Testing for Power Generation'. Details: IBC Technical Services, 57-61 Mortimer Street, London W1M 8JX. Tel: 0171 637 4383 Fax: 0171 631 3214

7th-8th

London: 'Doing Business in Uzbekistan'. Details: IBC Financial Focus, 57-61 Mortimer Street, London W1M 8JX. Tel: 0171 637 4383 Fax: 0171 323 4298

11th-12th

London: 'Strategy & Economics in the North Sea Oil & Gas Industry'. Details: IIR Ltd, 6th Floor, 29 Bressenden Place, London SW1E 5DR. Tel: 0171 915 5055 Fax: 0171 915 5056

11th-13th

Oxford: 'The Petrochemical Industry'. Details: The College of Petroleum and Energy Studies, Sun Alliance House, New Inn Hall Street, Oxford OX1 2QD. Tel: 01865 250521 Fax: 01865 791474

12th-13th

Stockholm: 'Mergers & Acquisitions in Nordic Power'. Details: IBC Financial Focus, 57-61 Mortimer Street, London W1M 8JX. Tel: 0171 637 4383 Fax: 0171 323 4298

12th-13th

London: 'Financing Gas Liquids'. Details: IBC Financial Focus, 57-61 Mortimer Street, London W1M 8JX. Tel: 0171 637 4383 Fax: 0171 323 4298

12th-14th

Amsterdam: 'Petrotech '96'. Details: Amsterdam RAI, PO Box 7777, NL-1070 MS Amsterdam. Tel: +31 20 549 1212 Fax: +31 20 646 4469

12th-15th

Kuala Lumpur: 'Economics of Platform Decommissioning'. Details: IBC Asia Ltd, 268 Orchard Road, #18-02 Singapore 238856. Tel: +65-732 1970 Fax: +65-733 5087

13th-15th

London: 'The International Oil & Gas Industry Export Conference'. Details: IBC Technical Services, 57-61 Mortimer Street, London W1M 8JX. Tel: 0171 637 4383 Fax: 0171 631 3214

13th-15th

Moscow: 'Benzokolonka '96'. Details: Jolanda Vink, Miller Freeman BV, PO Box 200, 3600 AE, Maarssen, The Netherlands. Tel: +31 346 573777 Fax: +31 346 573811

14th

London: 'IFEG Conference: Towards the Millennium'. Details: Pauline Ashby, The Institute of Petroleum.

18th

London: 'International Business and the New Rules of Trade'. 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

18th-19th

London: 'Fraud & Information Brokering in the Oil and Gas Industry'. Details: IIR Ltd, 6th Floor, 29 Bressenden Place, London SW1E 5DR. Tel: 0171 915 5055 Fax: 0171 915 5056

18th-19th

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19th

London: 'Floating Production and Storage Installations'. Details: The Institute of Marine Engineers, The Memorial Building, 76 Mark Lane, London EC3R 7JN. Tel: 0171 481 8493 Fax: 0171 488 1854

19th

London: 'DTI Conference on Retailing in Central Europe'. Details: Pauline Ashby, The Institute of Petroleum.

19th-20th

London: 'Competition in the UK Gas Industry'. Details: AIC Conferences Ltd, 2nd Floor, 100 Hatton Garden, London EC1N 8NX. Tel: 0171 242 2324 Fax: 0171 242 2320

21st

London: 'Fuel for Thought - Making Jet Engines More Efficient'. Details: The Royal Society, 6 Carlton House Terrace, London SW1Y 5AG. Tel: 0171 839 5561 Fax: 0171 451 2693

21st-22nd

London: 'Oil and Gas Agreements'. Details: Langham Oil Conferences Ltd, 37 Main Street, Queniborough, Leicester LE7 3DB. Tel: 01509 881022 Fax: 01509 881576

23rd-25th

Bahrain: 'International Catalogue Exhibition - CE '96'. Details: Gulf Global Consultancy, PO Box 30072, Manama-Bahrain. Tel/Fax: +973 212 212

25th-26th

Vienna: 'Transmission and Distribution of Gas in the Emerging Markets of Central and Eastern Europe'. Details: IBC Financial Focus, 57-61 Mortimer Street, London W1M 8JX. Tel: 0171 637 4383 Fax: 0171 323 4298

Forthcoming Events

25th-29th

Leeds: 'Spark Ignition Engine Emissions'. Details: Department of Fuel and Energy, University of Leeds, Leeds LS2 9JT. Tel: 0113 233 2494 Fax: 0113 233 2511

25th-27th

Oxford: 'The Aromatics Business'. Details: The College of Petroleum and Energy Studies, Sun Alliance House, New Inn Hall Street, Oxford OX1 2QD. Tel: 01865 250521 Fax: 01865 791474

26th-28th

Edinburgh: 'The Strategic Importance of Oil & Gas Technology'. Details: Clansman Monarch Ltd, Quality Court, 27 Maritime Lane, Edinburgh EH6 6RZ. Tel: 0131 554 1122 Fax: 0131 554 1123

December

2nd-3rd

London: 'World Baseoils'. Details: ICIS-LOR Conferences, The Coach House, 21 St Johns Road, Richmond, Surrey TW9 2PE. Tel: 0181 332 7689 Fax: 0181 332 7690

2nd-6th

Singapore: 'Improved Bulk Liquid Measurement'. Details: Abacus International, 214 Incheon Road, South Woodham Ferrers, Essex CM3 5WU. Tel: 01245 328340 Fax: 01245 323429

2nd-6th

Paris: 'MESUCORA: The International Exhibition of Measurement, Control, Regulation, Automation, Engineering and Industrial Information Technology'. Details: Promosalons, The Colonnades, 82 Bishops Bridge Road, London W2 6BB. Tel: 0171 221 3660 Fax: 0171 792 3525

3rd-5th

London: 'PETEX '96'. Details: PESGB, 2nd Floor, 17/18 Dover Street, London W1X 3PB. Tel: 0171 495 6800 Fax: 0171 495 7808

3rd-6th

Vienna: 'GASTECH '96'. Details: Gastech Secretariat, London RA1, Glen House, 200/208 Tottenham Court Road, London W1P 9LA. Tel: 0171 436 9774 Fax: 0171 436 5694

4th-5th

London: 'Land Resources: On the Edge of the Malthusian Precipice'. Details: Science Promotion Section, The Royal Society, 6 Carlton House Terrace, London SW1Y 5AG. Tel: 0171 839 5561 Fax: 0171 451 2693

4th-6th

London: 'Intermodal '96'. Details: IIR Exhibitions Ltd, Market Towers, 2nd Floor, 1 Nine Elms Lane, London SW8 5NQ. Tel: 0171 344 3823 Fax: 0171 344 3855

5th-6th

London: 'Controlling Carbon and Sulphur; International Investment and Trading Initiatives'. Details: The Royal Institute of International Affairs, Chatham House, 10 St James's Square, London SW1Y 4LE. Tel: 0171 957 5700 Fax: 0171 957 5710

9th-10th

London: 'UK & European Gas: Price, Supply & Demand'. Details: Bookings Department, IBC Financial Focus, 57-61 Mortimer Street, London W1N 8JX. Tel: 0171 453 2703 Fax: 0171 323 4298

9th-11th

London: 'Floating Production Storage Systems'. Details: IBC Technical Services Ltd, Gilmoora House, 57-61 Mortimer Street,

London W1N 8JX. Tel: 0171 637 4383 Fax: 0171 631 3214

10th

London: 'BIOMASS: Fuelling the Future'. Details: The Conference Department, The Institute of Energy, 18 Devonshire Street, London, W1N 2AU. Tel: 0171 580 0008 Fax: 0171 580 4420

11th

London: 'Transformation in the Gas Industry: Meeting the challenge of competition'. Details: The Economist Conferences, 15 Regent Street, London SW1Y 4LR. Tel: 0171 830 1116 Fax: 0171 931 0228

11th

London: 'Managing & Trading Gas at the Beach'. Details: AIC Conferences Ltd, 2nd Floor, 100 Hatton Garden, London EC1N 8NX. Tel: 0171 242 2324 Fax: 0171 242 2320

12th-13th

London: 'Subsea '96 International Conference'. Details: Knighton Enterprises Ltd, 2 Marlborough Street, Faringdon, Oxon SN7 7JP. Tel: 01367 242525 Fax: 01367 241125

12th-13th

Aberdeen: 'Latest Advances in Offshore Processing'. Details: The Bookings Department, IBC UK Conferences Ltd, 57-61 Mortimer Street, London W1N 8JX. Tel: 0171 453 2058 Fax: 0171 631 3214

12th-13th

Dallas: 'Managing Fuel Risk'. Details: The Center for Business Intelligence, 70 Blanchard Road, Suite 4800, Burlington, MA, USA 01803. Tel: +1 617 270 6200 Fax: +1 617 270 6216

Call for Papers

Second World Congress on Emulsion

23-26 September 1997
Bordeaux, France

Specialists from such diverse application sectors as cosmetics and pharmacy, paints lubricants, inks, adhesives, detergents, the road industry, agrochemicals and food industry or photography are invited to submit their 15-20 line abstracts to the Scientific Advisory Committee within the following four main themes:

1. Formulation and preparation of emulsions
2. Characterisation, Long-term stability — Rheology
3. Emulsion behaviour in usage
4. Industrial applications — case histories — new developments, new constraints

Deadline for submission of abstracts is
30 November 1996

Send to: CME,
50 Place René Clair,
92100 Boulogne-Billancourt,
France
Tel: +33 1 47 61 76 89
Fax: +33 1 47 61 74 65

Technology News

Global communications — wherever you are

Satellite communication company Station 12, a subsidiary of Dutch telecommunications company KPN, launched a new service in October that will offer users a portable commercial global satellite service. Based on four geostationary satellites, communicating through land-based receiving stations, the service can be accessed through terminals no larger than a lap-top computer.

The system is independent

of conventional telecommunication networks and hopes to open up opportunities in areas such as oil, gas and mineral exploration, and will ease problems encountered in trying to communicate in remote areas where no telephone infrastructure exists. The company claims test call transmissions have so far been successful and full-scale trials are currently taking place.

Noise monitoring made easy

RION of Japan has introduced a new Type 1 Precision Integrating Sound Level Meter, designed for measuring both workplace and environmental noise to British and European standards.

The RION NL-18 has four operating buttons; the extensive set-up keys and programming controls are recessed and covered to prevent tampering or accidental resetting during use; the set-up parameters will be retained even after switch-

off. It is claimed to be easier to use than most meters.

The meter has two LCD displays — one presents measurement data in both digital and analogue forms and the other is a graphics display which shows instantaneous sound levels and both graphic and numeric presentation of octave and third octave spectra. The instrument will store 100,000 instantaneous sound levels and the battery life span in continuous operation is 24 hours.



The RION NL-18

Lightweight breathing apparatus meets safety standards

The Racal 4000 International CABA (compressed air breathing apparatus) is a new addition to the company's range of respiratory protection equipment.

The equipment has been developed for use in toxic environments where a high level of respiratory protection is needed through the use of com-

pressed airline breathing apparatus or where prolonged decontamination procedures are necessary.

The set meets the EN137 and EN139 standards, is Marine Agency approved and suitable for a variety of applications in marine, fire service, oil and gas industries and chemicals manufacture and handling.



Trials of the new breathing apparatus (right) based on the Racal 4000 BA (left)

High levels of vapour suppression with new VSA Mobile

The Hi-Combat VSA Mobile from Angus Fire makes it possible for industrial emergency response personnel to apply stable vapour-suppressing foam to spills of hazardous chemicals.

Superstable foam is produced by applying Alcolac foam in combination with new Alcolac VSA and is said

to suppress hazardous vapours for much longer than conventional foam coverings.

The Mobile is a fully self-contained unit with two 60-litre storage tanks for Alcolac and Alcolac VSA. It comes with built-in proportioning and application equipment, including four lengths of chemically resistant Duralline hose.

Hazardous approval for hygrometer

A new Ceramic Moisture Sensor hygrometer, called Cermet, has been launched by Michell Instruments. The hygrometer provides high levels of performance for the measurement of humidity, from trace levels to saturation, and is suitable for use in processes where there may be large variations in moisture content over a period of time.

The instrument operates

at -80°C to +20°C dewpoint and is suitable for use in vacuums down to 10-5 bar absolute. It can also operate at pressures of up to 300 bar gauge in both benign and aggressive gaseous media.

The hygrometer meets CENELEC approval for use in hazardous applications and can also be operated with a cable length of up to 500 metres.

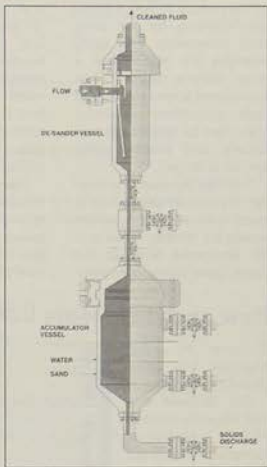
Technology News

Successful trials carried out on wellhead desander

The Expro Group has introduced the Wellhead DeSander which enables sands and solids recovery from multi-phase well streams during production or clean-up operations. In tests of five wells, volumes of sand ranging from 214kg to 1566kg were collected from each well.

The objective of the new system is to reduce the risk of sand from entering process systems contained within production platforms, thus eliminating erosion and blockage problems which can cause lengthy and costly shutdowns.

The product was developed from a Joint Industry Projects effort by Shell UK



Exploration and Production and Krebs Petroleum Technology.

Nozzle offers faster fire extinguishing in confined areas

Lurmark has added a new nozzle designed to protect goods stored in confined spaces to its range of BETE nozzles for fixed fire suppression.

The TF29-180 provides fire protection wherever there is little clearance between the spray nozzle and the material to be protected. It has a unique spray pattern which is characterised by an inner spray cone surrounded by a curtain of large droplets. The larger droplets penetrate

the combustion area and the smaller droplets provide a deluge which quickly extinguishes the fire.

The nozzle is designed for applications such as deluge systems for offshore platforms, storage tanks and loading areas and water curtains for protecting personnel, equipment and structures from heat radiation.

The BETE-N series of nozzles is certified for use on ships and offshore installations by Lloyd's Register of Shipping.

Explosion-proof, marine-approved mini switch

KDG-Mobrey has introduced an all stainless steel electromechanical level switch which has been approved for use in marine environments. The M-Switch can be used for high/low level alarm and

pump protection duties in marine and offshore applications and small storage tanks. It is resistant to corrosion in marine environments and is also available in explosion-proof versions.

A new line pipe material

Transmitting untreated oil and gas from remote fields can reduce costs in the development of new oil and gas fields. Therefore a material which can stand up to the corrosion loads involved in the transportation of untreated sweet gas is required.

Mannesmannrohr GmbH has introduced a new line pipe material which has been developed for this purpose.

The MW CR 13 LC is a 13 percent chromium steel with a low carbon content

which is suitable for the manufacture of oilfield tubulars and line pipe. The reduction of the carbon content makes the material suitable for welding.

The steel features good hot forming characteristics in a relatively wide temperature range which is ideal for processing into seamless tube in the company's hot rolling mills.

As a line pipe steel it corresponds to grade X 80 according to API 5L (lowest heat treated grade).

Longer lasting corrosion protection

Long-term corrosion protection is paramount for FPSOs as maintenance painting offshore is an expensive operation.

Oil companies are now demanding long-term protection and low life-cycle costs (LCC) for floating production and transport units.

Jotun has introduced the 'Total Corrosion Protection

Concept', which combines the company's experience with the economics of LCC evaluation.

The concept works on the compatibility of the paint system and cathodic protection system.

It was launched at ONS in Stavanger and the company offers support in more than 50 countries.

Automated colour analysis



A new automatic colorimeter has been introduced by The Tintometer Ltd which has been designed specifically for colour analysis of mineral oils and petrochemical products.

The Lovibond PFX990/P measures colour according to the accepted petrochemical industry scales, whilst results can also be displayed in terms of transmittance, tristimulus values, chromaticity coordinates and internationally recognised CIE values.

The colorimeter has an

automatic option for measuring colour which eliminates time-consuming procedures of visual methods. Measurements are initiated by just a single keypress and take less than 30 seconds to complete.

A software program for connection to a PC computer enables rapid transfer and processing of data, comparisons between standard and sample measurements plus storage of colour data for traceability and future reporting.

Technology News

Cost-cutting for car wash owners



Ryko International has introduced a remote diagnostic system designed to reduce operational costs involved with vehicle washing.

The fault finder identifies the cause of the problem and lets the engineer know, before he leaves the depot, what parts and tools are required to do the repair.

A computerised modem link identifies any fault with

the wash system and then automatically alerts the service depot. This reduces the downtime of the machine and saves wasted call-outs.

A sophisticated data logger provides a wash management system which monitors the machine's operation.

The system is currently available as an option with Ryko wash machines.

New online serviceable pig signaller

Pipeline Engineering has launched a new design of online serviceable pig signaller that can be easily removed, serviced or replaced while the line is at full working pressure — up to 245 bar. Overall costs savings are significant with the Servi-Sig signaller as it costs less than 25 percent of the price of valve-mounted retrievable signallers.

It is claimed that operation is leak-free and the valve unit is serviced and

hydro-tested prior to each replacement. The tool is available for rent or purchase and only one set is required which cuts costs.

The welding boss is made from ASTM A105, A350 LF2, A694 F52. The internals, cap and flag are made from 316 stainless steel. All materials are supplied in accordance with NACE MR-01-75 and standard certification is to DIN50049 3.1B for all pressure-retaining parts.

Launch of latest version of PAWS

Saladin has announced a new Windows version of PAWS (Petroleum Analysis Workstation). Version 6.0 takes full advantage of the increased flexibility that the Windows environment offers, enabling users to display several charts and reports on single screen and to transfer objects to other windows applications.

Graphs and reports can be stored in the library and retrieved when required.

Configurations range from stand-alone systems to large networked installations and Excel application PAWSLink is also available and enables users to update Excel files automatically as new information becomes available.

Early leak detection for forecourts

Fines, clean up/shutdown costs and image damage are all very costly to petrol retailers. Working on the basis that prevention and early warning are better than a cure, Wayne Dresser has introduced a new method of leak detection, whereby leaks can be stopped immediately until product uplift can be arranged.

The ISM Nucleus is a combined point of sale and forecourt control system, which works by testing tanks and all associated lines at the same time using low pres-

sure (1.5 psi) inert nitrogen balanced through a vent line. The system operates on both pressure and vacuum to provide accurate readings on tank and line conditions — so there is no need to close down a service station. The test can be carried out in 2-3 hours and two compartments can be tested at the same time.

The kit will enhance the forecourt owner's approach to important environmental issues as well as keeping the service station operational.

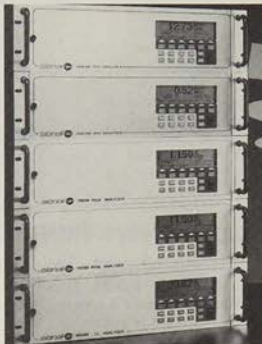
New analyser meets VOC demands

A new Hot FID analyser has been launched by Signal.

The 3000HM is a fast response Heated Flame Ionisation Detector, designed for continuous measurement of Volatile Organic Compounds (VOCs) for research and compliance monitoring in industrial automotive applications.

The analyser has a totally automatic microprocessor-based operation, auto-diagnostics and fully configurable alarms are also integral to the unit.

It is fully self-contained



and has a facility for a dual voltage of 115V ac or 230V ac that is switchable from the rear panel.

Contacts

KPN	+31 (70) 30 332 4500
Quantitech	01908 227722
Racal Health & Safety	01344 388000
Angus Fire	01844 214545
Michell Instruments	01223 424427
The Expro Group	01224 723601
Lurmark	01954 260097
KDG Mobrey Ltd	01753 534646
Mannesmann GmbH	+49 (211) 820 2375
Jotun-Henry Clark	0171 481 2741
The Tintometer Ltd	01722 327242
Ryko International Ltd	01403 240364
Pipeline Engineering	01748 818341
Saladin	01932 243233
Wayne Dresser	01875 402190
Signal Instrument Company	01276 682841

Institute News

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 Mr N D Urwin, Brown Cooper
 Mr S Welkers, London
 Mr M O Williams, BMT Marine Information Systems

Mr S Windley, Bristol
 Mr P T W Wood, Wakefield
 Mr P Wray, British Gas Trading

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 Mr I Chisholm, London
 Mr M C Dunn, Aberdeen
 Mr C M Newman, Weybridge
 Mr A Yakovlev, London

STUDENT PRIZEWINNERS

Miss B A Ireland, East Lothian
 Dr A Offer, Australia
 Miss A K Smith, Cambridge

AROUND THE BRANCHES

Aberdeen

12 November: Eastern Trough Area Project (ETAP), Charlie Cosad, ETAP Wells Alliance Team Leader, BP

East Anglia

21 November: The Eastern Group

Edinburgh & South East Scotland

5 November: Young Students' visit to BP Grangemouth
 November: Annual Student Lecture *Oil Exploration in Colombia*, (POSTPONED)

Essex

13 November: Ladies Evening: *Christmas Shopping at Sainsbury's*, Mrs Janice Trevillion, Home Economist, J Sainsbury plc.

Humber

28 November: Humber Pilots Service, Captain P P Hames

London

12 November: *The Business Development Manager in Exploration & Production*, Graham Lyon, Deminex UK Oil & Gas Ltd

Midlands

20 November: *The Need to Protect Petrol Retailers from Unfair Practices*, Mr Bruce Petter, Director, PRA

Netherlands

27 November: Joint meeting with Royal Institute of Engineers on *Decommissioning*

Northern

19 November: *Liverpool Bay Oil and Gas — A North West Special*, Mr C Grenz

22 November: 60th Annual Dinner Dance

Stanlow

15 November: Annual Dinner Dance

26 November: *The Lubrication of Constant Velocity Joints*, Dr G Fish, Senior Tribologist, GKN Ltd

Yorkshire

12 November: *Energy Efficiency*, Mr J Ward, ETSU

Energy issues in Central Europe: fuel retailing

Tuesday 19 November

The second of two IP conferences in association with and supported by the Department of Trade and Industry on the new developing energy markets of Central Europe, focusing especially on the 'new economic tigers', the Czech Republic, Slovakia, Poland, Hungary and the Baltic states.

This event will concentrate on the opening of new opportunities in fuel retailing to serve the rapidly developing consumer markets of the region and will include the views of major international oil companies, the domestic players, their suppliers and partners.

This is an important event for people and companies seeking to understand these new markets, especially contractors, equipment suppliers, consultants and service companies for which openings may arise as existing facilities are upgraded by indigenous organisations or with the involvement of major international investors.

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

*Pauline Ashby, The Institute of Petroleum, 61 New Cavendish Street, London W1M 8AR UK
Tel: 0171 467 7100 Fax: 0171 255 1472*

Have you moved?

If so please contact the Membership department with
your new address.

UK Deliveries into Consumption (tonnes)

Products	1 Aug 1995	*Aug 1996	1 Jan-Aug 1995	*Jan-Aug 1996	% Change
Naphtha/LDF	187,960	204,128	1,912,952	1,873,393	-2
ATF - Kerosene	772,579	767,048	5,028,143	5,314,256	6
Petrol	1,920,081	1,891,725	14,438,628	14,719,896	2
of which unleaded	1,206,242	1,271,956	9,046,803	9,876,648	9
of which Super unleaded	81,945	53,974	643,597	497,047	-23
Premium unleaded	1,124,297	1,217,982	8,403,206	9,379,601	12
Burning Oil	121,770	170,138	1,704,721	2,114,444	24
Derv Fuel	1,136,986	1,192,354	8,794,049	9,447,680	7
Gas/Diesel Oil	574,298	546,625	4,833,430	5,089,745	5
Fuel Oil	669,895	461,762	5,489,182	4,508,426	-18
Lubricating Oil	76,654	68,666	599,790	578,958	-3
Other Products	704,624	755,449	6,013,583	5,847,854	-3
Total above	6,164,847	6,057,895	48,814,478	49,494,652	1
Refinery Consumption	543,849	552,847	4,215,494	4,363,009	3
Total all products	6,708,696	6,610,742	53,029,972	53,857,661	2

† Revised with adjustments *preliminary

The Institute of Petroleum Implementation of Pregnant Workers Directive Management of Health & Safety at Work (Amendment) Regulations 1994

Increasingly women work while they are pregnant and many resume work whilst breast feeding. There are some workplace hazards which may affect the health and safety of the mothers and children both before and after birth.

Although pregnancy is not an abnormal state of health, and its health and safety implications can be accommodated by normal procedures, it must be taken into account in the assessment of health and safety risks and its management in the workplace.

The European Directive addresses the protection of the health and safety of pregnant workers and their children both before and after birth. This new IP publication provides management guidance regarding this Directive, including appropriate hazard identification, risk assessment and actions.

ISBN 0 85293 174 3

Price £24.00 (25% discount to IP members)

Available from The Library, Institute of Petroleum, 61 New Cavendish Street,
London W1M 8AR, UK. Tel: 0171 467 7100 Fax: 0171 255 1472
E-mail: lis@petroleum.co.uk

Petroleum Measurement Manual Part IX: Codes of Practice for Meters

Section 3: Guidance on the Installation of Turbine Meters in Loading Gantries

The majority of gantries in the United Kingdom are equipped with positive displacement (PD) meters. However, turbine meters offer the advantage of lower purchase price, which has led to an increasing trend towards their use in loading gantries. The installation requirements for turbine meters are significantly more demanding than those for PD meters if they are to achieve the standards of accuracy and performance demanded by the oil industry. For this reason, a turbine meter should not be regarded as a direct, 'bolt-in' replacement for a PD meter. This guidance has been produced to assist those considering the installation of turbine meters.

The information in this guide summarises the current knowledge of the effects of installation conditions on turbine meter performance. Observance of the guidance during system design will enable turbine meters to achieve the optimum performance of which they are capable.

ISBN 0 85293 172 7

Price £28.00 (25% discount to IP members)

Available from The Library, Institute of Petroleum, 61 New Cavendish Street,
London W1M 8AR, UK. Tel: 0171 467 7100 Fax: 0171 255 1472
E-mail: lis@petroleum.co.uk



THE INSTITUTE
OF PETROLEUM

IP Week 1997

Programme of Events

Monday 17 February

Conference: Financing the International Oil Industry — the continuing challenge

To be held at the Cavendish Conference Centre

Tuesday 18 February

Morning — The 10th Oil Price Seminar

To be held at the Cavendish Conference Centre

Tuesday 18 February

Luncheon at The Dorchester Hotel, London

Guest of Honour and Speaker — Lucio A Noto, Chairman of the Board and Chief Executive Officer of Mobil Corp.

Tuesday 18 February

Afternoon — Energy Economics Group meeting with the British Institute of Energy Economics

Latest developments in the Middle East — an insider's view

Admission free.

Tuesday 18 February

Evening — IP London Branch Meeting

Transport for the Millennium

A dialogue involving the Freight Transport Association and Transport 2000

Admission free.

Wednesday 19 February

Annual Dinner at Grosvenor House, London

Guest of Honour and Speaker — Eddie George, Governor of the Bank of England

Thursday 20 February

Conference: Achieving Competitiveness through Innovation and Value Engineering — how the lessons of the upstream can be applied to the downstream and beyond

To be held at the Cavendish Conference Centre

For further information please contact: Conference Department,
The Institute of Petroleum,
61 New Cavendish Street,
London W1M 8AR UK
Tel: 0171 467 7100
Fax: 0171 255 1472