PETROLEUM REVIEW

IP THE INSTITUTE OF PETROLEUM

April 1994

World Petroleum Congress

Meets next month in Stavanger

Emissions

Atmospheric emissions from the upstream oil and gas industry

Lubricants

How to dispose of used lube oils

Middle East

Energy projects benefiting from the prospect of general peace in the Middle East

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EDITORIAL

Editor: Carol Reader
Deputy Editor: Susannah Cardy
Production Editor: Lyn Gaffney
61 New Cavendish Street, London W1M 8AR
Telephone: (071) 636 1004.
Fax: (071) 255 1472

ADVERTISING

Advertisement Director: Colin Pegley
Advertisement Manager: Jim Slater
Jackson Rudd & Associates Ltd.,
2 Luke Street, London EC2A 4NT.
Telephone: (071) 613 0717
Fax: (071) 613 1108

APPOINTMENTS AND RECRUITMENT

Advertisement Manager: John Pughe
2 Luke Street, London EC2A 4NT
Telephone: (0689) 872500

PUBLISHERS

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INSTITUTE OF PETROLEUM
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Director General: Ian Ward

61 New Cavendish Street, London W1M 8AR
Telephone: (071) 636 1004. Telex: 264380
Fax: (071) 255 1472

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COVER PHOTO
Stavanger
Photo courtesy of Norwegian Tourist Board

NEWS IN BRIEF

26 February

The former managing director of Attock Oil has been fined £120,000 for conspiring to fraudulently inflate the profits of the collapsed BCCI. The Old Bailey heard that Mr Mohammed Baqi signed false papers confirming that his company owed $90m to BCCI, in order to make the bank appear more profitable.

28 February

Calor Gas announced it is forming a partnership with Alliance Gas to supply natural gas to small business customers. The butane company claims it can cut bills by 15 percent and has appointed Sir James McKinnon, the former director-general of OFGAS, to act as adviser to its new business.

1 March

BP has announced the discovery of natural gas off the coast of Vietnam. It will not know until the year-end whether gas exists in sufficient quantities to be commercially exploited.

A petrochemical complex is to be built on the islands of Pulau Ayer Merbau and Pulau Seraya, off Singapore. Four operators, including Petrochemical Corp of Singapore, have agreed to the US$2.13bn construction, which will be the second such development in the area.

2 March

Energy Minister Tim Eggar has given the go-ahead to Marathon Oil's plans for the development of the Beinn field in the Northern North Sea.

Highland Fabricators is to slash the workforce at its Nigg yard to 50 because of an eight-month gap between contracts. A year ago, the workforce was halved from 1,200 to just 600.

Total Oil Marine has acquired a package of Northern North Sea interests from Shell Expro, including some of the NUGGET discoveries, which lie between the greater Alwyn area and the Frigg gas field.

Mitsubishi Oil has completed its purchase of Fina's interest in the Andrew and ETAP fields, giving the Japanese firm its first North Sea assets. A new company, MOC Exploration (MOEX), has been formed to manage the assets, said to be worth $200m.

3 March

Tullow Oil has added a further exploration licence to its acreage in Pakistan. The firm has undertaken to drill one well on the Kandhkot East licence, located in the middle Indus region.

A tanker has been seized but not arrested by US Customs in Boston, after it was suspected of transporting 'Libyan-connected' oil. The US authorities are now investigating the Liberian-flagged 96,833 dwt tanker, *Diana*.

BP said it plans to axe around 200 jobs in four of its oldest North Sea fields, leaving 450 staff to run the Beatrice, Buchan, Clyde and Thistle installations.

Petrobras has discovered oil reserves totalling 1bn barrels in four new fields in the Campos Basin, off the coast of Rio de Janeiro. The company plans to spend $2.5bn developing the finds.

7 March

Pakistan's Minister of Petroleum and Natural Resources has announced a range of new fuel investment perks, aimed at attracting both local and foreign investment. The country's oil production currently accounts for only a quarter of its domestic needs, according to Mr Anwer Saifullah Khan.

8 March

Clyde Petroleum has taken over Agip's stake in the UKCS Andrew field, which is expected to produce first oil and gas in late 1996. The £12.7m deal also includes the rest of Agip's 17.88 percent interest in Block 16/27a.

10 March

Gazprom has agreed to resume gas supplies to the Ukraine, allowing Kiev one month's grace in which to resolve its £600m debt. However, Russia warned that deliveries would be stopped altogether if the situation was not resolved by 10 April.

11 March

Energy Minister Tim Eggar has curbed the anticipated growth in British wind farms by announcing that a maximum of only 20 out of 230 applicants for subsidies would have any chance of winning a grant.

13 March

Gazprom has agreed to buy a 25 percent stake in a new natural gas joint venture with Neste, which is due to be set up by 1 May. The deal also includes a 20-year Russian gas supply contract which could result in Finnish imports rising to more than 4bn cubic metres a year.

Elf has shelved plans to develop the two Frigg field satellites, Skirne and Byggve. A spokeswoman said the decision had been taken in the light of continuing delays in the renegotiation of the Frigg Treaty between Norway and Britain.

15 March

Clyde Petroleum announced that the first well in Block 32 Yemen has been suspended, having tested water with minor quantities of oil.

Arco British has agreed terms with Shell and Esso to acquire their joint stake in the Southern North Sea block 49/24, which contains part of the Gawain field. In a separate deal, Arco has agreed terms with Mobil, operator of block 49/29a into which Gawain extends, to unite the field on a 50-50 basis, with Arco as operator.

16 March

Repsol and Petrogal have signed a memorandum agreement of co-operation, which is expected to lead to joint participation in specific projects.

The Sicilian fabrication yard, Consorzio Italoffshore, has angered British MPs by cancelling a planned visit from the DTI's Offshore Supplies Office. The visit was to have been part of a UK investigation into allegations of unfair foreign competition against Scottish yards.

17 March

DuPont has opened up an office in Ho Chi Minh, making it one of the first US companies to venture into Vietnam since President Clinton lifted the 30-year economic embargo on 3 February.

Agip Petroli, the refining and distribution subsidiary of ENI, has sold its LPG distribution business, Liquipibigas, to Novogas as part of the run-up to privatisation. The $146m deal also includes the sale of a 35 percent interest in the Livorno gas import terminal.

18 March

A new freight forwarding company for the oil and gas industry has been set up in Port Harcourt, Nigeria. A joint venture between Schenker International of Frankfurt and Bulkship of Nigeria, the operation will be active at both a local and international level.

The Zeepipe group has put forward plans for a new $275m gas pipeline which would bypass Ekofisk. According to Statoil, the 150km pipe would begin slightly north of Ekofisk and end at the B11 compressor platform on the Norpipe line.

Elf and HSE have launched separate inquiries after a 'very small' fire broke out in the process module of Piper B. The blaze was extinguished within minutes and there were no injuries.

19 March

A booklet on maximum recommended prices for the resale of gas is now available for suppliers and customers in the industrial market. Published by OFGAS, it takes into account the government's implementation of VAT on domestic fuel and power.

20 March

Denmark expects to achieve a balance in its energy trade by 1997, according to the country's energy board. Known reserves will sustain current oil production levels for 20 years and gas production for 45 years.

22 people perished after an explosion ripped through the Maltese-flagged tanker, *Stolidi*. Situated 250 miles off the island of Masira in the Arabian Sea, the tanker had just loaded with 65,000 tonnes of oil.

22 March

BP and its partners in the Tarim Group have signed an agreement with the China National Petroleum Corporation to conduct a three-year seismic programme in Block 4 of the Tarim Basin. A subsequent option allows the group to carry out exploration drilling.

Statoil (UK) Ltd has been awarded an 11-block licence offshore the North West of Ireland in the 1993 Frontier Round. The award is for a 16 year exploration period.

DATES FOR YOUR DIARY

IP THE INSTITUTE OF PETROLEUM

Monday 11th April 1994
5.00 pm for 5.30 pm – 7.00 pm

'Environmental Regulations – the Trade-Off between Cost and Benefit'

Speakers:- **Klaus Kohlhase,** *Head of Corporate Health, Safety and the Environment, BP*

Paul Horsman, *International Oil Campaign, Greenpeace*

(with **Kalle Hesstvedt,** *Co-ordinator of Climate Campaign, Greenpeace to participate in the panel discussion)*

Chairman: **Elizabeth Dower Jeffrey,** *Managing Director, Oakwood Environmental*

The speakers will address the complex and controversial issue of the balance between the cost to the oil and gas industry of implementing environmental regulations, and the ensuing benefit to the environment. The presentations will be followed by a panel discussion.

Organised by Energy Economics Discussion Group
IP Contact: Pauline Ashby

Thursday 14 April 1994
2.45 pm for 3.00 pm

Visit to British Gas plc HQ Library and Information Service

IFEG members are invited to visit the British Gas HQ Library and Information Service. It holds a broad collection of material reflecting the range of company interests; the gas industry, energy in general, economics, engineering, science and technology, environmental affairs, company and business information, accountancy and management.

The visit will give an overview of all services available. Included will be Selective Dissemination of Information (SDI), current awareness services, CD-ROM, audio visual material.

Places are limited to 20.

Organised by Information for Energy Group
IP Contact: Ms Lyn Nevin

Monday 9 May 1994
5.00 pm for 5.30 pm – 7.00 pm

'Bitumen – Designer Product or Product Dustbin?'

By Michael Downs, *Consultant*
and
Terry Fabb, *Refined Bitumen Association*

The speakers will address the current status of the bitumen market worldwide, the size and value of trade in geographic markets and likely product developments from the paradoxical viewpoints of 'bottom of the barrel' and 'top rate technology'.

Organised by Energy Economics Discussion Group
IP Contact: Pauline Ashby

Thursday 16 June 1994
5.00 pm for 5.30 pm – 7.00 pm

'West European Refining in a Global Context – Is a Decade of Restructuring About to Pay Off?'

By Chris Brown, *Senior Consultant, Chem Systems Ltd*

The West European refining industry has for several years suffered from over-capacity and hence poor margins. This talk will analyse how much this reflects a global problem and whether the major restructuring it has undertaken now sets the foundation for better years ahead.

Organised by the Energy Economics Discussion Group
IP Contact: Pauline Ashby

All meetings are held at the Institute of Petroleum. Please tell the IP contact if you plan to attend any of these free meetings.
TEL: (071) 636 1004. FAX: (071) 255 1472.

Fatal tanker crash threatens future of Bosporus Strait

Last month's tanker disaster in the Bosporus could result in new shipping restrictions for the busy strait.

The crash, between a bulk carrier and the 66,822-tonne Cyprus-flagged oil tanker *Nassia*, adds enormous weight to Turkish calls for a curb on the volume of crude shipments from 1 July.

According to sources, new regulations drawn up by Turkey now have the support of the International Maritime Organisation (IMO) and are likely to be accepted at the body's May meeting.

They include a ban on vessels of over 200 metres in length and new rules making it compulsory for vessels over 90,000 tonnes to be accompanied by two tugs and an escort boat and to have a pilot on board.

The Turkish authorities estimate that shipments of crude along the Bosporus from Black Sea terminals will increase by 1.5 million b/d over the next five years. Their aim is to channel this increase away from the shipping lane and into pipelines, a far more favourable economic option for Turkey.

Despite the impending rules, however, many shipping brokers seem sceptical of Turkey's power to impose real restrictions on the lane.

'The CIS will create havoc if Turkey attempts to impose economic restrictions on the Bosporus', one source told *Petroleum Review*. 'The Strait is a lifeline and the CIS will insist that it is kept open in the normal way.

'When everything is settled down, this whole issue will be brushed under the carpet with a few extra regulations as window-dressing.'

The Cyprus-flagged tanker, *Nassia*, in flames last month

The crash itself took place near the Black Sea mouth of the Bosporus. As *Petroleum Review* went to press, at least 15 crew were dead and 16 missing, while a 13km oil slick was moving steadily towards the Black Sea coast.

It took five days for the fire onboard the *Nassia* to be extinguished and the waterway to be re-opened.

Retailers lobby Parliament over 'illegal' ruling

The Petrol Retailers' Association (PRA) has told DTI minister Neil Hamilton that new government rulings on petrol undertakings are in direct contravention of European law.

At a meeting last month with the Consumer Affairs Minister and his legal advisers, the PRA presented two sets of proposals which they claim 'would allow the undertakings to come back in line with European law'. The trade association has also taken its case to the Office of Fair Trading.

Changes to the 30-year-old rules governing the supply of petrol to retailers were announced by Mr Hamilton in January. As a result, the majors now have greater powers over what products can be sold in forecourt shops. *(See Petroleum Review, February 1994).*

But according to the PRA, oil companies are prevented from restricting the choice of packaged lubricants and other non-oil goods under European law. 'The implication therefore is that British oil companies are not bound by EC Regulations.'

As *Petroleum Review* went to press, the minister was said to be considering the views put to him by the PRA.

According to industry sources, the association will lobby the Trade and Industry Select Committee or even take its case to the European courts if the minister fails to take action.

New offshore safety chief named

Mr Roderick Allison (57), currently Director of HSE's Safety Policy Division, is to succeed Mr Tony Barrell as head of the Offshore Safety Division.

Mr Barrell, who retires at the end of May, revealed the identity of his successor during an interview with *Petroleum Review* (see page 160).

Mr Allison has previously held posts in both the Department of Employment and Ministry of Labour.

Five engineering contracts awarded for Gas Interconnector

The seven oil and gas companies backing plans for a UK-Continent gas interconnector have awarded five contracts for offshore survey and conceptual engineering work.

- Conceptual work for the Belgian terminal goes to Tractabel.
- Onshore pipeline conceptual engineering within Belgium has been won by Haecon.
- EMC, in consortium with a number of other companies, has clinched the offshore pipeline work.
- The offshore survey will be carried out by Geoteam.
- And the UK terminal design will be carried out by a British Gas team.

In a change to its original plans, the sponsor group has also increased the diameter of the proposed pipeline from 36 to 38 inches and is currently considering the option of a 40-inch diameter.

A spokesman for the Interconnector Group told *Petroleum Review* that, while the move to a 38-inch line was technically-driven and would not make a difference to potential volumes, the 40-inch option would increase capacity to as much as 20 billion cubic metres (bcm) of gas per annum. The current design concept allows for a capacity of 15 bcm per annum.

However, a final decision on pipe size is not expected until quite late on in the proceedings. 'Possible double counting means that we will not know the true capacity requirements for some time yet', said the spokesman.

A final decision on whether or not the project goes ahead is expected by the end of the year.

Members of the Interconnector Group are British Gas, BP, Conoco, Distrigaz, Elf, Norsk Hydro and Statoil.

NEWSDESK

$300 billion required to develop China's energy sector

The cost of developing China's energy sector could be as much as $300 billion in this decade alone, according to Amoco Vice Chairman Lawrason D Thomas.

In a keynote speech at the China Petroleum Investment Conference in Beijing, Mr Thomas said China's economy and energy sector would benefit greatly by developing a world-class exploration and production industry and maximising the development of its abundant domestic oil and natural gas resource base.

'China's energy industry is fundamentally strong and attractive, but the growth in its economy has outstripped the nation's ability to develop new oil fields domestically.' The result, he said, was that China had become a net importer of crude oil and oil products in 1993 for the first time in 30 years.

He urged China to sustain its high rate of economic growth by diversifying its energy sources and improving the sector's infrastructure and facilities.

For private industry, Mr Thomas said China not only offered abundant natural resources, but a highly-educated and technically sophisticated workforce.

However, he warned that the country needed to make certain changes to its economic, regulatory and investment régime in order to attract foreign interest. He recommended a clearer definition of the respective roles of the central government, local regulatory entities and state-owned enterprises.

'China could also more clearly define....the industry structure it desires, pricing mechanisms within that structure and the role of foreign investors.' Full convertibility of the Chinese currency should also remain high on the country's list of national priorities, he added.

While the risks and challenges for international investors in China are real, said Mr Thomas, they can be managed successfully by maintaining a spirit of openness, candour, cooperation and trust.

The Vice Chairman also called for China to be made part of the GATT process straightaway and urged the US government to renew China's most-favoured-nation status 'to ensure a smooth continuation of trade and investment ties between the two countries'.

New club offers Nigerian links

Scottish service companies are being offered a foothold in Nigeria's £2 billion-a-year oil and gas industry via a newly-formed business club.

Located in Lagos, the club has been opened up in the offices of Hunting Oilfield Services by Scottish Enterprise National (SEN). Its aim is to offer firms local market knowledge and support services, including help with key logistics.

'With the advent of deepwater acreage opening up under 100 percent foreign ownership', said Mr Ewan Hunter, SEN's export executive, 'the need for advanced technology in Nigeria will be underlined'.

Few Scottish firms are involved in Nigeria's oil and gas industry at present but, according to SEN, over 40 companies have expressed an interest in the new scheme so far.

If it proves to be a success, more sites may open up in other parts of Nigeria.

Union onslaught on Safety Cases

No sooner has a Safety Case been accepted by the Health and Safety Executive (HSE), than it will come under careful scrutiny once again – this time from the unions.

'The unions were not properly involved in the formation of the operators' Safety Cases', said Mr Ronnie McDonald, general secretary of the offshore union, OILC. 'However, the Safety Case is a living document designed to come under constant review and restructuring. Therefore, once the vast majority have been accepted and returned by the HSE, they will then come under the intense scrutiny of the offshore safety reps.'

The OILC plans to set up a service for its members, offering expert advice on all aspects of the Safety Case and a professional researcher is to be employed to this end.

The union has also strengthened ties with the Norwegian Federation of Offshore Unions (OFS). The move underlines fears at the OFS that, if and when Norway joins the European Union, its superior safety standards will be eroded to harmonise with the rest of Europe.

(See page 160.)

Germany steps up pressure on Elf

Germany has stepped up pressure on Elf Aquitaine to honour its contract with the Thyssen group and build an oil refinery at Leuna.

German Economics Minister, Gunter Rexrodt has insisted that Elf fulfil its side of the bargain or face around $880 million in breach-of-contract penalties. Chancellor Helmut Kohl has also intervened, writing personally to French Prime Minister, Edouard Balladur.

Abandonment would also means losing the Minol petrol station chain, which consists of over 800 east German sites.

Meanwhile, Elf, which failed to commence construction of the east German refinery by the agreed deadline, has been courting Russia in the hope of reducing its two-third stake.

According to *Petroleum Intelligence Weekly (PIW)*, Rosneft is offering to supply crude in exchange for a 23-27 percent interest in the plant. One possibility is that the Russian holding company will join up with the integrated oil corporations, Yukos and Surgutneftegaz. 'This would allow the Russians to regain a significant role in the East German oil industry – and to access processing facilities far superior to those at home,' said *PIW*.

It is still in Elf's interests to find a Western buyer who would pay in cash, however. One strong incentive to possible purchasers, if it were to be included in the package, would be the profitable Minol chain.

Elf won its bid to build the 200,000 b/d refinery in July 1992 over BP, which tendered only for a refurbishment of the existing plant.

NEWSDESK

Saudi Arabia threatened by financial shortfall

Saudi Arabia must resolutely defend its share of OPEC oil production and curtail its domestic expenditure if it is to avoid running into serious financial difficulties over the next five years.

If the Kingdom decides instead to act as swing-producer for OPEC, it will have to borrow more than $30 billion by 1998, according to a new report from the Centre for Global Energy Studies (CGES). This would leave the country with just $10 billion worth of foreign exchange cover for the Riyal.

Saudi's vast financial reserves, which reached a peak of over $170 billion in 1982, have now been largely depleted. Last year, they were down to around $27 billion. Much of the government's social and defence spending has traditionally depended on these accumulated reserves.

The report warns that the Kingdom is likely to feel the collective weight of its fellow OPEC members to concede its market share. 'This pressure may increase when Iraq re-emerges as a fully-fledged oil exporter because Saudi Arabia is perceived as having taken the lion's share of Iraq's market.'

However, the signs are that this pressure may nevertheless be resisted. The Saudi budget for 1994 signalled a 20 percent reduction in state spending from the previous year. 'This was regarded by many as a tacit acceptance by the government that low oil prices are here to stay which in turn suggests that the oil industry cannot rely on Saudi Arabia restoring oil prices to the $18-a-barrel level.'

According to the report, if the Kingdom *does* manage to restrict its annual invisible deficits and not yield its market share, it will be able to 'weather the next five years of weak oil prices and face the 21st century with equanimity'.

Sheikh buys OK Petroleum

A Saudi Arabian business man has agreed to buy OK Petroleum, the Nordic region's biggest refiner, giving his country its first substantial presence in the European market.

Sheikh Mohammed Al-Amoudi purchased the refining group for $1.2 billion including debt through a newly established company, Corral Petroleum. The sellers are the KF co-operative group (52 percent), Neste (24 percent) and the Swedish state (24 percent).

North Sea costs set for dramatic drop

Operating costs in the UK sector of the North Sea are predicted to fall by between 15 and 30 percent during the next six years, cushioning the effects of any further fall in oil prices.

According to a new report from analysts at Arthur Andersen, the industry's attempts at cost-cutting will have their greatest impact between now and the end of the century. This is because the industry's economy drive has been directed towards its older platforms.

If operating costs are projected over a longer period of time the drop is less impressive. Andersens have predicted that operating expenditure per barrel of oil equivalent (boe) will fall by around 6.5 percent over the next 30 years and capital expenditure by around nine percent.

Nevertheless, these savings will still curb the effects of a drop in oil prices. Assuming an average price of $13bbl over the same time period, Andersens have calculated that, while revenue per boe will drop by nearly a quarter, net profit will fall by just 12 percent.

Safety watchdog announces yet more reforms

The latest set of goal-setting safety reforms for the offshore industry, this time dealing with the management of offshore installations, has been announced by the Health and Safety Commission.

Industry has until the end of May to comment on the draft regulations, which are due to come into force at the end of the year.

The proposals are designed to rationalise, modernise and simplify current legal requirements on notification of changes in ownership of installations, the movement of installations in and out of UK waters and the intention to commence pipeline work.

Other areas covered by the reforms include: the appointment, function and powers of Offshore Installation Managers; permit-to-work systems; the provision of written instructions; arrangements for helicopter operations; and the keeping of records of persons on board.

The last set of proposals to be issued by the HSE in its ongoing review of safety legislation was criticised by UKOOA for being 'over-prescriptive'. This time, the initial reaction has been far more favourable.

'On first read we haven't found any surprises', Bryan Taylor, UKOOA Director of Technical Affairs told *Petroleum Review*. 'Informal consultations have gone on for several months and we don't foresee any problems.'

Three contractors tender for Foinaven

BP and Shell could be producing oil from the Foinaven discovery west of Shetland as early as the beginning of 1995.

According to sources, three consortia of offshore contractors have been invited to submit tenders before the end of this month for initial development of the massive deep-water field.

At least one consortia has suggested that this first phase of production, which would be based upon a floating production system with tanker offtake, could start as soon as 'early 1995'. At the very latest, first oil is expected by the end of 1996 at a rate of 60-100,000 b/d.

The three groups invited to apply for development design are: Brown & Root Marine with Reading & Bates, FMC and SBM; Kvaerner H&G Offshore with FSSL and National; and McDermott Engineering with Golar-Nor.

A 'pre-sanction' contract is expected by the summer and the official go-ahead by the end of the year.

Foinaven, which has estimated recoverable reserves of 250-500 million barrels, was the first of two massive discoveries in the deep Atlantic waters west of Orkney and Shetland. The second, Schiehallion, has estimated reserves of a similar volume.

Phase one development at Foinaven must be by tanker loading because it is a 'tried and tested technique', said Mr Tom Fyfe, deputy asset manager Atlantic Frontier. However, in the longer term, a pipeline linking floating tethered production platforms to either Sullom Voe or Flotta may well be a viable option.

There is no indication yet as to which terminal is favoured. They are equi-distant from the discoveries and, according to Mr Fyfe, 'Technically there is nothing to choose between them'.

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Petroleum Retailing Regulation and Competition

Thursday, 28 April 1994

The Petroleum Retailing Conference provides a valuable forum for retail management from the oil industry, station operators and suppliers of equipment and services from both the United Kingdom and elsewhere in Europe to meet and to discuss topics of current interest in the retail petroleum market.

This year the topic will be 'Petroleum Retailing: Regulation and Competition'. The programme will include consideration of government initiatives towards deregulation and the response of the oil companies and independent dealers towards such proposals; the issues of environmental liabilities and of the problems of physical security; and new developments in tank installation.

Topics to be presented will include:

- The Retail Petroleum Market Today
- Deregulation – 'The Story So Far ...'
- Regulation and Competition from the Dealer's Viewpoint
- Security and Profitability
- Tank Installation Developments
- Changes to Forecourt Retailing
- Supermarkets and Hypermarkets
- New Techniques for Site Selection

For further information and a copy of the registration form, please contact Caroline Little, The Institute of Petroleum, 61 New Cavendish Street, London W1M 8AR. Tel: (071) 636 1004, Fax: (071) 255 1472

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Clean Coal Technology

How Soon a Threat to The Gas and Oil Industry?

21 April 1994
2.30 p.m. – 5.30 p.m.

Coal is the main fuel used worldwide to generate electric power. The booming countries of Asia have large coal burning power station projects and increasingly demand lower emissions into the atmosphere. In Europe gas is being used to generate electricity cleanly but there are worries that gas will become expensive. Clean coal technology such as flue gas desulphurisation and fluidised combustion is being applied to reduce coal burning emissions, and integrated coal gasification systems will be commercially proven by the end of the century. There is clearly a threat to gas and oil industry extension into the power generator market – the question is how soon?

Mr Keith McNair, Director of Fuel Management, National Power, will chair this half-day seminar at which current and future prospects for economic application of clean coal technology will be discussed.

The following papers will be presented:

- ▲ World coal industry scene
- ▲ Flue gas desulphurisation at Drax power station
- ▲ Advanced fluid bed power generation system
- ▲ Coal Gasification
- ▲ When will clean coal technology be economic?

For a copy of the registration form, please contact Caroline Little, The Institute of Petroleum, 61 New Cavendish Street, London W1M 8AR. Tel: (071) 636 1004. Fax: (071) 255 1472.

On the safety case

Mr Tony Barrell CB

This month, the Offshore Safety Division celebrates its third birthday. To mark the occasion, *Petroleum Review* quizzes Chief Executive Tony Barrell over such issues as Safety Cases, differences with UKOOA and the identity of the next offshore safety chief.

Susannah Cardy: The first stage of the assessment procedure for Safety Cases should now be over. How many of the 215 presented to you were thrown out in the first round and for what sort of reasons?
Tony Barrell: The first stage is not yet over for all Safety Cases but, so far, none have been dismissed out of hand. However, some Cases were returned after initial screening identified missing pages or other similar administrative problems.

In January, Ross Offshore's semi-submersible rig Kingsnorth Explorer became the first installation to pass both stages of the assessment procedure and have its Safety Case accepted. How many have since been accepted?
By the beginning of April, we hope to have completed the process on 20.

Does a quick acceptance mean that the Case is more exemplary, or is it simply a matter of which papers are on top of the pile?
The first to be accepted are generally the first ones we started work on.

By 30 November 1995, it will be unlawful to operate an installation in British waters which does not have a Case that has been formally 'accepted' by the Health and Safety Executive (HSE). However, there is an appeals procedure to the Director General of the HSE and his two deputies. Will installations be allowed to operate pending such an appeal and, if so, is this not a possible loophole for oil companies?
No. Our work schedule has been prepared so that assessment of all the Safety Cases will be completed three months prior to the November 1995 deadline. This would allow sufficient time for any appeals. In any case, the Safety Case Regulations do not allow installations to be operated during the appeals procedure.

When are the Offshore Installations (Prevention of Fire & Explosion, and Emergency Response) Regulations and Approved Code of Practice (ACoP) due to come into force?
The Health and Safety Commission's intention is that the Regulations will be submitted to ministers this autumn. Subject to their approval, they could be made by the end of this year.

During the consultative process for these Regulations, UKOOA took issue with the ACoP, claiming it was too prescriptive. Recently, UKOOA Director General Harold Hughes claimed that there were signs of a 'grudging acceptance' within OSD that UKOOA was right. Is this true and have the regulations now been changed to suit their views more closely?
Obviously we are well aware that UKOOA has publicly expressed concern. The Commission's consultative document published last September specifically asked for comments on the balance between ACoP and guidance and we are now considering all these responses before reporting back to the Commission in the summer. I'm afraid it's too early to say what, if any, changes may be made to the proposals.

Next on the statute books will be regulations covering the management and administration of offshore installations, pipe-line works and connected activities. How much extra work will they entail?
There will inevitably be some extra work for industry in absorbing the new regulations and in terms of amending manuals and changing systems. However, the costs involved in this initial period will be more than offset over time against the overall savings made through the simplification or removal of over-prescriptive requirements, which is the main purpose of the new regulations.

At the moment, for example, exemptions are often granted when work is carried out on not normally-manned installations (NNMIs). In fact, in total, over 300 exemptions from the existing requirements have to be given out each year for a variety of reasons. The Management and Administration Regulations would replace this regime with more flexible, goal-setting requirements.

When are the COSHH (Control of Substances Hazardous to Health) Regulations due to be extended offshore? They resulted in a fair amount of worry and confusion onshore – do you foresee similar problems offshore?

I can't give you a precise date yet. HSE's Health Policy Division, rather than OSD, is currently undertaking a consolidation of all the existing COSHH Regulations – the original 1988 statute plus the amendments made since – and when this exercise is completed, which will be later this year, the resulting new regulations, together with the EC Biological Agents Directive, will all be extended offshore.

It's perhaps worth mentioning that many of the offshore companies already have experience of applying COSHH onshore and a number of them apply it offshore already. This should minimise any such 'problems'.

Are you looking into claims of faulty helideck fire-fighting foam made by Chubb earlier this year?

Over the past two years, our Operations Branch has been carrying out inspections of all helidecks, in conjunction with the Civil Aviation Authority. One aspect of these inspections is to examine the type and condition of the fire-fighting foam to ensure that it is satisfactory.

The larger oil companies are handing over increasing amounts of work and responsibility to contractors. How will OSD ensure that it is getting the health and safety message over to this sector of the offshore industry too?

We recognise the move to contractors and our inspectors will be increasingly targeting them during visits to offshore installations and to vessels within HSE jurisdiction. We will also be following up any issues arising from these inspections with individual companies. Our Operations Branch is currently developing new systems and procedures for inspection and investigation which will take account of such factors.

The principles of safety management apply equally to all companies and HSE has issued comprehensive guidance on such principles, for example, 'Successful health and safety management'. The major contracting companies working on the UKCS have already recognised these principles and are implementing them within their own company arrangements.

Can you predict what will be required of the oil industry in terms of safety precautions in, say, the next five years? Is there much more to come or is the basic legislative framework already in place?

It's really impossible to predict what new, unforeseen, safety issues may need to be tackled in the years to come and we are still at a relatively early stage in the process of Safety Case assessment, which may throw up new issues to be addressed. The Commission is reviewing all the offshore health and safety legislation inherited from the Department of Energy (as it then was) and has mapped out a comprehensive programme of legislative reforms which will keep HSC, HSE and the industry fully occupied for the immediate future.

You will be retiring at the end of May. Can you tell me the name of your successor?

My successor will be Roderick Allison, who is currently Director of HSE's Safety Policy Division.

Conference report

Ways and means of disposing of used lube oils

An IP conference, 'Used lube oil disposal' was held in London last month. Two papers are reproduced here following some reflections by the conference chairman, EI Williamson, Director, College of Petroleum and Energy Studies. Some of the statements may seem controversial – the speakers, the IP or Petroleum Review welcomes any reaction or comment.

Sitting in the front line, as Chairman of the IP Used Lube Oil Disposal Conference, one tends to miss things, being mainly concerned with survival! However, the following is an attempt to point out some of the highlights, in terms of factual information and additionally to bring out the key issues from the conference.

One point at the beginning. Re-refining is a very old established business, which has existed for probably 50 years. It has tended to be on the fringes of the main lubricant business and run by small companies, who used sulphuric acid refining, known as acid/clay treatment.

Much better technologies are now available using, for example, Mohawk-licensed feed pre-treatment and hydrogen. In the 1980s new plants or revamps have been completed by KTI of Holland in Greece, Tunisia, United States, Canada, Germany and Egypt. However, the numbers of plants for re-refining is far exceeded by built for collection, clean-up and resale (of fuel). For example there are 200 collection/clean-up plants in the United States but only three re-refineries. In the United Kingdom there are 12 main fuel recovery plants, served by 40 collection/transfer stations (each about 20,000 litres in size) and in turn now supported by 1,354 waste oil tanks at local authority waste collection sites. However, the last oil re-refineries in the United Kingdom closed in 1986.

The new re-refineries tend to be larger and serve a particular region. Evergreen in California has a 55,000 ton plant serving Arizona, California, Nevada, Oregon and Washington. One other large plant serves the Great Lakes area of Michigan, Indiana, Ohio etc.

What is driving the business now?

It is clear that as far as most energy companies and individuals are concerned, the 'Environmental Age' began in the late 1980s, say 1988. Since then interest, concern and legislation have increased exponentially.

The critical legislation in the United States seems to be that concerned with the clean-up of sites. In recent years several acquisitions, of chemical or oil companies failed to take place, once the cost of site clean-up was assessed. It has proved to be, in some cases, several times more than the cost of the acquisition!

In Holland the authorities gave one company six months to decide to clean up a lube oil site, where blending had taken place for 75 years. The alternative was either to dismantle the plant, extract the contaminated earth and replace it, then rebuild the plant or move to a new location.

Therefore blenders, oil companies and chemical companies are now not only extremely concerned about their own activities but also about their own products in the market-place. Within limits it has been possible to improve control at the industrial customer level. Oil testing in situ, 'laundering' of customers own oil and services such as Castrol's 'Oil Save' are reducing both total discard and potential pollution.

There are, however, significant worries about the D-I-Y motorist and his individual activities. This is more of a problem in some countries than others. For example in the United States, D-I-Y is not very popular as against the large numbers of '10 minute' oil change centres. Over 2 million tons of engine oil is changed at these centres annually, compared with 600,000 tons in the D-I-Y market.

However one private survey of a particular UK conurbation showed that 63 percent of motorists serviced their own cars and of these 80 percent admitted putting the oil into the drainage system. Since one gallon of oil can contaminate up to a million gallons of drinking water, the concern of the river authorities is understandable.

It is this pollution threat which has led to the BP and Texaco experiments with 'oil banks' on their service stations and to local authorities putting oil tanks onto their amenity sites. Nevertheless it begins to look as though control of sales points must also be a longer-term issue, as is now the case in Austria.

The key issues

The main issue, about which no-one seems to disagree, is that recovery, collection and control must be a sound idea. In the United Kingdom this has been very successful and some 250,000 tons of used oil are now collected annually and turned into useful fuels out of the 800,000 tons of lubricants sold annually.

The disagreements emerge about re-refining itself and its return to the markets. Here the first issue is quality and the others are utilisation and market image.

The re-refiners, using the latest technology claim that the re-refined base oil is actually better than new oil, as it has been stabilised by the loss of volatile functions etc. In the United States, Evergreen seems to have won this argument. They have not only secured API 'SH' passes for re-refined oil but have persuaded Arco, Chevron and Unocal to blend re-refined oil into their new products. In several other countries oil companies are mandated by the government to use re-refined oil both to support the local re-refining industry and ensure that pollution is avoided.

Other speakers mentioned widespread fraud in particular countries where cheap re-refined oil found its way into (ostensibly) sealed cans of new

branded lubes from major suppliers.

This is then the dilemma for major lube oil marketers – ' The shall we, shan't we syndrome... If we do, shall we tell the customer?' My personal feeling is that the consumer is not yet ready to put re-refined oil into his own expensive, much treasured motor car!

Other methods of utilisation are being successfully used, such as bitumen flux oil, process oils, etc, where the customer gains a price benefit, without loss of performance.

Another new idea, highlighted by Texaco Alternative Energies at the conference, is to use waste oil as the solvent base in a large-scale process to dispose of oil tyres in Louisiana. Another tyres-to-energy plant started up at Wolverhampton in the United Kingdom in 1993. It will generate 30MW of electricity and will utilize 7.5 million tyres annually.

Where do we go from here?

Judging by the number of delegates (145), this subject is of considerable interest.

One is struck by the patchiness of the situation worldwide and even in Europe. Clearly individual efforts to move into re-refining will fail, without the support both of a legislation programme and a collection system. The US experience, where companies will pay collectors to take away the oil is different from the United Kingdom, where the collector pays for the waste oil, as it is known ultimately to have a fuel value.

There is a need for industry/government cooperation and consensus, if we are not going to stumble along, as we have been doing. It is up to the trade associations, such as the Chemical and Oil Recovery Association (CORA) in the United Kingdom, UKPIA, CONCAWE and so on, to formulate the industry's position and present conclusions and recommendations at the European Union (EU) level. I believe that this is happening, although it did not come out in conference discussion.

Getting the oil back under control is probably the primary objective. Re-use for original purpose is the bridge no-one wants to cross, despite the EU view that regeneration is the most rational option!

EI Williamson, Director, The College of Petroleum and Energy Studies

Used lube oil disposal – global overview

By Alf Cluer

NOTE: In this paper, the used oil generator is the party (could be an individual) which generates the used oil, while recycling refers to any environmentally sound disposal system, eg: burning, gasification, re-refining.

Magnitude of the problem

In order to estimate the magnitude of the used lube oil problem worldwide, it is necessary to know:

- **Estimated total new lube oil consumption**, by country or by region
- **How much of this appears as** used oil
- **How much of the used oil is collected** and recycled
- **How is it recycled**
- **A final balancing unaccounted** figure which gets into the environment in one form or another, with detrimental effects.

It is much simpler to make this list than to obtain the information!

The easiest part of the information to assemble, and probably the most reliable, is shown in **Figure 1**, which gives the estimated worldwide lubricants demand for 1995. Note that it includes (as base oil capacities only) figures for China and the Former Soviet Union, which have only recently become generally included in petroleum statistics and may perhaps be questionable. But between them they appear to consume about a quarter of the world's lube oil, and increase the lube oil consumption from about 1.0 percent of the crude oil consumed to about 1.3 percent. The effect on North America and Europe, where the information is much better and more reliable, is to reduce their proportion of world lube oil consumption from well over 50 percent to a little over 40 percent.

Note that all the quantities in Figure 1, except China and the Former Soviet Union, are of lube oil consumed, ie including about 7 percent additives (which themselves include a proportion of base oil as diluent).

Figure 2 is an attempt to estimate how much of each main lube oil application remains when the oil has done its job and is renewed or replenished. This is clearly a most important figure in our search for the truth – and where the guessing starts. A portion of the lube oil consumed leaks or is burned during use, eg automotive crankcase oil passing piston rings to the combustion chamber and being burned there with the fuel. The percentage of lube oil remaining after use (the 'used oil generation factor') depends on the type of lubricant and the application. The figures in the table have been estimated 'through field and laboratory study'. Figure 2 is an estimate for West Germany in 1988, but the figures will vary from country to country, depending on the proportions of different categories of lubes and on the machines in which these lubes are used.

The net used oil generation factor in this case works out at 53 percent. One can immediately ask, how much of the 47 percent loss already pollutes the environment by leakage etc? If we take the global lube oil consumption estimate of say 42 million tonnes/year in Figure 1 and apply the used oil generation factor of 53 percent, we arrive at about 22 million tonnes used oil available for recycling, and 20 million tonnes already lost into the environment with a small proportion burned during use. The actual figures for individual countries in regions are much harder to come by.

Dumping of used oil

The quantity of used oil available for recycling is a lot less than the quantity generated, by virtue of the amount of used oil dumped in eg: landfills or down the drains. Again, figures are hard to come by, but an estimate for the United States is given in **Figure 3**.

As can be seen, the proportion of used oil generated which was estimated to be dumped was 32 percent. This relates to an annual used oil generation of 4.388 million tonnes (Ref 2), so that 1.4 million tonnes was disposed of this way. The figure gives rise to statements such as 'More used oil is illegally disposed of or dumped in the United States each year than the sum total of 35 Exxon Valdez crude spills in Alaska' (Ref 3).

FIG 1 – FORECAST WORLD-WIDE LUBRICANTS DEMAND 1995

	Tonnes (000)	% of Total
1. North America	9,500	22.6
2. Western/Eastern Europe	8,400	20.0
3. Australasia/Japan	6,670	15.9
4. Central/South America	3,480	8.3
5. Middle East	1,140	2.7
6. Africa	1,720	4.1
7. China	2,550	5.7
8. C.I.S.	8,500	20.7
Total	41,960	100.0

Source: *REf 1*
Note: *Items 1-6 are finished lubes (including additives). Items 7-8 are base oil capacities*

FIG 2 – USED OIL GENERATION IN WEST GERMANY 1988

Type of Lubricant	Consumption (000 tonnes)	Used oil generation factor (%)	Used oil generated (000 tonnes)
Automotive	376	63	237
Metal Working	85	70	59
Transmission	73	80	58
Turbine	7	87	6
Hydraulic	145	50	72
Moulding, white oils, greases	77	0	0
Insulating	17	90	15
Others	287	40	115
Total	1,067	53	562
Total	41,960	100.0	

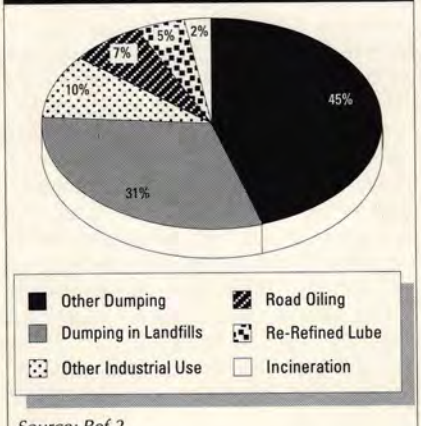
Source: *REf 2*

Disposal options

Used oil which is not generated, some 40-50 percent of the new oil consumed, has gone into the environment anyway, through leakage, spillage, combustion etc. The quantity seems to be considerably more than is deliberately dumped - the only control would be better housekeeping, maintenance of machinery etc.

The collection problem – The environmental problems arising from surreptitious dumping of used oil are to a large extent from D-I-Y people who change their own crankcase oil and then have nowhere to put the used oil except down the nearest drain - or anywhere close at hand if there is no drain. Different systems to encourage collection of this oil have been tried in many parts of the world and include those listed in the API paper Ref 2. They are reproduced in **Figure 4**.

FIG 3 – DISPOSITION OF USED OIL IN THE USA 1988



Source: Ref 2

All those measures are intended to put the used oil management industry onto an economically viable footing, for without this it cannot succeed. The situation is complicated by the varying values of the recycled product, be it fuel oil or lube oil, as the price of crude oil changes. Extremely sharp crude oil price changes like 1979 and 1986 would have a big effect on used oil management viability.

Burning/incineration – Because used oil requires very simple pretreatment (dewatering, perhaps distillation of light ends) to render it fit for burning almost anywhere, the major outlet for used oil is in burning. As shown in **Figure 3**, 58 percent of the used oil generated in the United States in 1988 was burned and only 2 percent was re-refined. If one calculates how much of the used oil collected (as distinct from that generated) was burned, the figure rises to 58 x 100/68 = 85 percent **(Figure 5)**.

The National Oil Recyclers Association of Virginia maintains that this situation arises because of the long distances used oil would have to be transported to re-refining plants, compared with disposal sites by burning. There are some 200 fuel processing plants across the country compared with less than six re-refining plants (Reference 4) and an extra 5 cents per gallon transport cost for every 100 miles travelled. This high proportion of recycled used oil directed to burning rather than re-refining is also the position in many other countries.

The used oil may contain chlorine compounds eg: from chlorinated degreasing solvents, or zinc from lube additives, or lead from gasoline. Such contaminants can give rise to emission hazards on burning. These can be eliminated by directing such oils to cement kilns, where the high temperatures (up to 2000°C) break down even PCBs and so avoid the possibility of dangerous dioxin formation. Cement kilns obviate the necessity of special incineration furnaces with temperatures in the 1400°C region, to ensure no dioxin can possibly be formed.

Gasification – Gasification is an environmentally elegant way of disposing of many unwanted materials so long as they contain carbon. The used oil collection and transport cost problem applies in the same way as for re-refining; however the combination with waste tyre disposal must greatly improve the economics.

FIG 4 – USED OIL COLLECTION INCENTIVES

▲ Taxes & Subsidies	Finland, France, Italy, Spain, West Germany, Rhode Island
▲ Obligations for vendors of lubricants	Austria, West Germany, Massachusetts, New Jersey, New York
▲ Restrictions on over-the-counter sales of lubes	Austria
▲ Transportation franchises	France
▲ Collection sites and kerbside pickup	Oregon, numberous industrialised countries
▲ Public procurement	New Zealand, New York
▲ Public education	Several countries

FIG 5 – BURNING V RE-REFINING IN USA 1988

		Used oil generated (000 tonnes)	Used oil recycled (000 tonnes)
DIYers		627	-
Other Automotive		2,124	-
Industrial		1,627	-
		4,380	2,980
Percent	Burned	58	85
	Re-Refined	2	3
	Dumped	32	-
	Other	8	12
		100	100
Fuel Processing Plants		200	
Re-Refining Plants		3	

Transport costs add 5c per gallon for every 100 miles travelled.

FIG 6 – USED CRANKCASE OIL – SOME RE-REFINING PROCESSES

- ▲ Acid & Clay (Meinken)
- ▲ Propane Clarify/Acid Clay (IFP)
- ▲ Propane Clarify/Hydrotreat (IFP, Snamprogetti)
- ▲ Ultrafilter/Acid Clay (IFP)
- ▲ Demetallise/Filter/Hydrotreat (Phillips)
- ▲ Solvent Clarify/Hydrotreat (Berc) *
- ▲ Metallic Sodium Treat/Vac Dist (Recyclon, Leybold Heraeus)
- ▲ Thin Film Vac Dist/Hydrotreat (KTI)
- ▲ Thermal Deasphalting/Vac Dist (Viscolube-TBA)
- ▲ Coagulate Impurities/Centrifuge (British Rail)
- ▲ Pretreat/Thin Film Vac Dist/Hydrotreat (Mohawk-CEP)

** Solvent is 25% IPA, 25% MEK, 50% n-butyl alcohol (BERC is Bartlesville Energy Research Centre, part of US Dept of Energy)*

FIG 7 – WORLDWIDE RE-REFINING INDUSTRY

Country/Region	*Number of Re-Refineries*	*Re-Refined Oil (000 t/y)*	*Type of Process*
USA	3	270	Thin Film
Canada	5	170	2 Thin Film 1 Phillips, 2 Acid Clay
W. Europe	13	340	Thin Film Propane, TDA, Acid Clay
China	280?	180	Acid Clay
India	40	40	Acid Clay
C.I.S	3	40	Acid Clay
Others	30	210	Mainly Acid Clay
	(approx) 370	(approx) 1,250	

Source: Estimated from Ref 5

Laundering – This generally refers to a particular clean-up operation on a specific used oil, collected from the used oil generator and returned to the source after processing. The collection/dumping problems do not apply to this type of recycling. Such a system could apply to used transformer oil after perhaps 30 years of service, returned to the transformer after clean-up to its original specification including electrical properties. The true loss in this type of laundering is very low (recorded as 10 percent in **Figure 2**).

Re-refining – Although only about 3 percent of the collected used oil is re-refined into virgin base oil quality, this is the operation which attracts most attention in terms of conservation of a valuable resource, diversity of re-refining processes, proof that the re-refined oil quality really does match that of new oil, and potential profitability.

The profit incentive is easily understood if one considers the value of used oil to be equivalent to fuel oil (0.5/0.7 times that of crude oil) and the value of new base oil to be say 2.5 times that of crude oil. Thus if crude oil costs about $100/tonne, the uplift in value from fuel oil to lube oil is from $70 to $250/tonne. There is therefore a big economic incentive to re-refine. This is why most countries have established some sort of re-refining industry.

Figure 6 lists some processes that have been developed for re-refining used crankcase oils, most of which have been commercialised. **Figure 7** gives a global view of the re-refining industry, including the processes used. Allowing for many assumptions in arriving at the figures, it is seen that the total volume of re-refined oil at 1.25 million tonnes is only some 3 percent of the new oil produced.

The acid and clay process still predominates in terms of numbers of installations but this is largely due to the number of plants recorded for China. The volume of used oil re-refined by acid and clay is about 40 percent of the total re-refined.

The acid and clay process creates its own environmental problem in disposing of the acid sludge produced. The likelihood in the less developed countries is that the acid sludge is dumped in a hole in the ground, a procedure which is no longer acceptable in most industrialised regions. However for plants of small capacity, say 1,000 - 5,000 tonnes/year, the catchment area for used oil feedstock need only be small, the plant is cheap, and the operation profitable if acid sludge can be dumped. There is a great disparity in size between acid/clay plants and those using more sophisticated processes. Essentially, the more expensive processes which can assure product quality and give high yields must have a certain minimum throughput to justify their economic existence.

In most of the used crankcase oil re-refining processes, a vacuum distillation stage is necessary to split the used oil into different viscosity fractions. This gives rise to problems of coking and equipment fouling because of the additives content, and different pre-treatments have been developed to remove the contaminants before distilling. These are noted in **Figure 6**.

Conclusions

Globally there is an environmental problem, because of 42 million tonnes per year consumed and 22 million tonnes used oil generated, only perhaps 10-15 million tonnes are recycled. Of this latter figure, only about 1 million tonnes are re-refined.

The environment up to now has taken second place to economics. Unless the used oil management system leading to any form of recycling is viable, its operation cannot be sustained. Therefore, incentives of the kind listed in Figure 4 are required in more areas of the world. This is likely to happen increasingly as the environmental problems are better appreciated.

The size of the all important automotive lubes problem is likely to grow as time goes on. Estimated world car populations are shown in **Figure 8**, which demonstrate how the number of cars in the non-OECD countries is expected to increase rapidly to the year 2020, giving a global figure then of 1,000 million cars compared with 500 million now. In spite of reduced frequency of crankcase oil changes, this must offer scope for a large increase in the used crankcase oil re-refining business. But the opportunity to clean up more of the used crankcase oil is unlikely to be developed unless enlightened governments create the right economic climate by suitable incentives.

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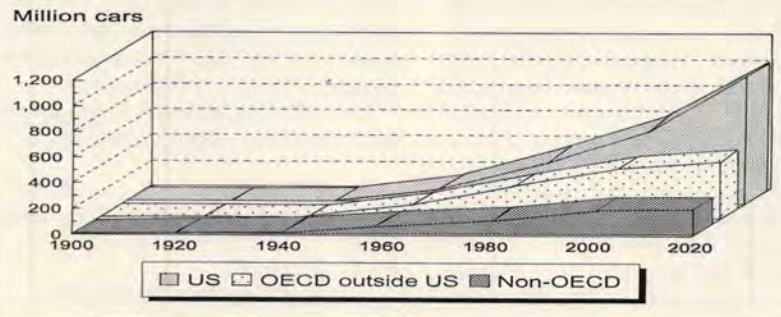
FIG 8 – WORLD PASSENGER CAR REGISTRATION



Source: Shell Selected Paper, Dec 1993

What should we do with used oil?

By D P Ramsden, Vice President, Evergreen Holdings Inc

Recycling of used oil appears to be a subject of growing importance and one that transcends many boundaries – national/product/political. Slowly but surely it is being woven into the fabric of society as part of a larger concern for the environment that in itself is coming to affect every aspect of our lives. Ultimately, recycling will become invisible. When products contain recycled components that are indistinguishable from virgin materials and are competitively priced, it becomes a matter of indifference to the beneficial user of an item; indeed they will not be able to tell that it has recycled content except by looking at the label. But that factor will be of critical importance.

This movement is not driven at the retail level by the man or woman in Sainsbury's but by the corporate purchasing policy pursued by Sainsbury's buyers (or British Telecom or Halfords). For this reason it is, as yet, not so easy to discern but the oil companies ignore it at their peril. The fact that most of their products are skilfully designed to be non-returnable may cause them to overlook the importance of recycling and its value in differentiating product in a commodity world.

Enough of the marketing philosophy – but bear it in mind when considering some of the technology driven solutions.

It is essential for the health of any recycling activity that the environmental objective be supported by commercial viability. Unfortunately, the economic framework in which we operate often fails to give signals that accord with the desire to conserve resources and protect the environment. Since this a matter of political choice, it is usually possible to adjust the framework with the result that we can always ensure that 'it pays'. However, getting this adjustment to the economic framework correct, using legislation and social exhortation, is a subtle process and, as recent German experience shows, it is not easy to achieve the targeted outcome. Sometimes it is not even easy to identify the target.

I should like to present an example where it appears that desirable environmental objectives have been made congruent with commercial reward as a result of legislative adjustments affecting the economic framework. Considerable hard work was also required!

Californian experience

Evergreen Holdings Incorporated has been in the used oil management business in California for nearly a decade but it has taken some time and considerable input of resource before achieving solid commercial success.

Through a number of operating companies, Evergreen collects used oil, principally but not exclusively automotive material, as feedstock for its San Francisco re-refining plant. As described in detail later, the re-refining process which is one of only a small number worldwide to use modern hydrogenation technology, restores the oil to as good as, or better than, virgin quality product. This baseoil is then used to produce a range of automotive and industrial lubricants which are sold back into the market-place, thereby closing the recycling loop. All steps of this process are commercially viable which, as mentioned before, makes this an example of the socio-economic framework supporting an environmental objective. Thus used oil is kept from undesirable disposal pathways whilst simultaneously conserving a resource for, potentially, multiple reuse.

Dimensions

In the United States, an estimated 2.25 million tons of used oil is generated annually; Evergreen collects approximately 55,000 tons/year (2.5 percent) of this principally from the state of California but also from Washington, Oregon, Arizona, and Nevada.

The collected material yields the following products (approximately) :-

- ***10% water***
  Treated and discharged to sewer
- ***13% fuel***
  Used as fuel on site or sold **
- ***12% asphalt flux***
  Sold as bitumen fluxing agent
- ***65% baseoil***
  Sold for finished lubricants blending

*** a proportion sold as gas oil*

Apart from the water (which comes in with the feedstock), all product streams have commercial value; additional margin is obtained on part of the baseoil produced since it is blended and sold as Evergreen branded lubricant.

Socio-economic framework

A number of factors work together in California to make the collection of used oil for recycling to finished lubricant a commercially viable operation.

1. Comprehensive Environmental Response, Compensation and Liability Act

Also known as CERCLA or Superfund. This federal legislation, enacted in 1980, has extensive and draconian penalties for remediation of contaminated sites. As long as a site remains in commercial operation, the Act is dormant; however, if the operator becomes bankrupt and abandons the site then all or any of the generators of waste found at that site will be held liable for whatever remediation costs are needed to restore it. A clean, professionally managed site which ceases operation will pose little risk whilst a site which has experienced escape of hazardous material resulting in contaminated soil or water will face extremely onerous remediation costs. Two US sites in Fresno and Salt Lake City are estimated to have incurred cleanup costs of $120 million. This has resulted in some substantial retroactive claims on companies who had thought that responsibility for their waste had been discharged by handing it to, apparently, responsible removal agencies.

This Act focuses the mind of generators with regard to auditing the disposal route for their waste and on the need to use a reputable and financially secure, fully permitted, bona fide recycler. It is, however, not possible to acquire indemnity from the pervasive reach of the act which is retroactive and almost unlimited in its power to seek out the deepest pockets.

2. Resource Conservation and Recovery Act 1976

This is the federal legislation which ensures 'cradle to grave' responsibility for hazardous waste by imposing management standards on generators and transporters of hazardous waste. Although used oil is not classified as hazardous waste at the federal level, it

must be managed as if it were in a number of states, including California. As with CERCLA legislation, this underpins a very positive approach to recycling. The effect of the foregoing rigorous legislative framework has been to limit the number of participants involved in used oil collection and to progressively raise the used oil management standards for both generators and collectors. The impact of this legislation became fully felt in California in the second half of the 1980s as the restrictive Hazardous and Solid Waste Amendments of 1984 came into effect.

This moved used oil collection from a product purchase basis to a waste disposal service; thus the oil value has shifted from being hydrocarbon price related to a service fee cost basis. This transforms the economics of collection!

3. California Oil Recycling Enhancement Act

A very recent addition to the aforementioned federal legislation is this law which was enacted in January 1992; the first part, which requires manufacturers of lube oil to pay a 16 c/US gallon levy to the California Integrated Waste Management Board, became effective in October 1992. The second part, which entitles fleet operators and certified collection programmes to receive 16c/US gallon for oil collected for recycling, has only functioned since April 1993. In this context, the lube oil on which a levy is charged and a refund obtained is automotive product only; industrial oil is not part of this scheme. Clearly, most of the Evergreen story to date has developed prior to the operation Or this Act and commercial viability has been achieved without this legislation. It is to be expected, however, that the effect of this law will be, as its title indicates, to enhance significantly the availability of oil recovered from the D-I-Y sector. It will achieve this by encouraging garages and workshops to accept used oil from the public since only by offering to take in oil will they be entitled to receive 16 c/USgallon for the oil generated from their own servicing activity. In addition, it is likely simply to increase the number of collection points available to the public. A minor, and possibly unintentional, side effect will be to make responsible D-I-Y more attractive by 16 c/USgallon relative to having a vehicle serviced. Overall, however a neat system for developing enhanced collection of used oil.

It must be noted, however, that it requires a system of administration and that it does nothing to support closing of the recycling loop, as practised by Evergreen.

4. The Californian psyche

In Californian state of excess, conscience is salved by concern for the environment but only at the margin ie; it is a second order effect. Thus using cars with relatively large engines and changing your oil every 3,000 miles (as many do) is offset by ensuring that the used oil is managed in an environmentally responsible way.

Since voluntary, fundamental attitude change can be very slow or non-existent when the changes are perceived as lifestyle-constraining, the important thing is to work on the possible. In California, this is where my company is able to return a modest portion of the used oil stream back to marketable lubricant. There is also no doubt that the environmental lobby is active, articulate and relatively well supported in America, with California having some of its strongest proponents. Environmental issues gain detailed coverage, particularly in the press. The philosophical ones less so.

5. The hazard level

Over many years, considerable debate has gone into the subject of the very real hazards associated with the management of post consumer used oil. A number of extraneous hazardous products regularly appear in used oil as a result of improper disposal, not of the oil but of that particular product; it is merely the fact that oil is an opaque liquid into which other difficult-to-dispose-of liquid wastes are 'lost'. This is an issue relating to the management of hazardous liquid waste in general rather than used oil in particular; however, the problem remains.

There is no doubt that, when improperly discarded, used oil can cause considerable ecological damage. Even when disposed of in accord with conventionally accepted criteria, it must be recognised that it has the potential to introduce a number of hazardous species into the atmosphere eg; heavy metals and post-combustion chlorinated species.

The following list shows the harmful products often associated with as-collected used oil:

- **Lead**
  Even where the gasoline pool is substantially lead-free, lead is found in used oil at potentially harmful levels. (as recently as March 1993, California EPA expressed concern about lead release from used oil, amongst other sources).

- **PNA/PCA/PAH**
  By whatever abbreviation, these potentially carcinogenic components are found in harmful levels.

- **Metals**
  Zinc, chromium, cadmium, vanadium, and copper present from additive package or engine wear.

- **Solvents**
  Present as a result of improper disposal of solvent or from parts de-oiling in workshops.

- **Chlorine**
  As for solvents, chlorinated products improperly discarded.

- **PCB**
  Only very occasionally found now, from its period of use as an insulating oil.

- **Hydrocarbons**
  Light components from internal combustion engine or contaminated fuel disposal.

- **Particulates**
  Combustion products and sediment.

Pathways for disposal

1. **Any of the aforementioned plus the** lube oil hydrocarbon can find its way into soil and/or water courses if improperly released to the ground. A small amount in water courses can render large volumes non-potable.

2. **Combustion will destroy some of** the above species but the extent can be uncertain under all but closely controlled operations eg; incinerators and possibly cement kilns. Some components, for example lead and metals, will still be released to atmosphere after the combustion process. In California, restrictions on the lead levels permitted in fuels mean that much of the used lube oil collected has to be routed to ships bunker fuel. Thus the hazard is removed from the shores of the state.

3. **Recycling offers the most attractive** route to managing the above contaminants. The lube oil is recovered for reuse. PCA (and potentially PCB) are destroyed with greater than 99 percent efficiency. Organic chlorine is converted to HCl and neutralised. Metals and very heavy hydrocarbons leave as an asphaltic residue stream which is used as a flux for bitumen manufacture where they become locked into a non-leachable solid matrix.

4. **Whilst some of the foregoing** benefits can be obtained by the gasification/coking option, clearly the valuable lube oil molecules are destroyed in this process. At this point I would refer to my opening remarks about the value of a recycled tag on the molecules.

Evergreen operation

Evergreen's operation has three components – collection, re-refining and sales/marketing. It is also involved in vacuum truck activities which are an additional source of oil/water feedstock into the plant, together with the recycling of used antifreeze and the collection of used oil filters.

The plant was originally built within the constraints of a $10 million financing bond from the state of California with the result that it was relatively small compared to its potential market. Active debottlenecking has, however, resulted in a considerable increase over original design capacity (from approximately 30 to 50,000 tons/year). Energy consumption per ton of finished baseoil is some 60 percent of that for virgin production, whilst capital costs also compare favourably; both important factors when looking for additional baseoil manufacturing capacity.

Collection

A fleet of more than 65 trucks is operated by Evergreen in its collection business throughout California and adjoining states. Collections are made from over 6,000 sites including auto workshops and fleet maintenance depots (75 percent) as well as D-I-Y, government and industrial bases thus building confidence in the quality of the material being routinely collected. In addition, a minor amount of product is brought in by small independent collectors. All used oil undergoes a 10 minute test programme before being accepted for discharge from the collection vehicle; sealed samples are retained from each pickup point in order to provide an audit trail in the event of undesirable components being detected.

On well-established routes, the collection service can operate almost independently of the generator; the driver will call in on a regular basis and uplift the used oil whenever a sufficient quantity has accumulated. In-cab computers have recently been installed to create instantaneous invoices showing the collection charge and the quantity of oil removed.

Re-refining

Used oil undergoes six processing steps with hydrogenation as the key stage in restoring the oil to a quality level.

- ***Step 1***
  A proprietary chemical pretreatment step which a) dramatically reduces fouling throughout the plant and b) greatly increases hydrotreating catalyst life. Prior to developing this detailed understanding of the phsysico-chemical processes occurring in the plant, downtime amounted to well over 100 days per annum compared to much less than 20 now.

- ***Step 2***
  After filtration and product heat exchange, the feed stream passes via a hot oil exchanger into an atmospheric flash column where water and gasoline type hydrocarbons are flashed off at about 145°C.

- ***Step 3***
  In the next stage, after hot oil preheat heavier diesel type components are removed under vacuum flashing conditions (260°C and 0.08 atmosphere).

- ***Step 4***
  The remaining hydrocarbon stream containing dirt, metals and polymeric material is then fed to a high vacuum, thin film evaporator (LUWA type) which provides high temperature, low residence time flash conditions from which a residual bottom stream is produced that is used as a flux in the asphalt industry. (370°C and 0.01 atmosphere).

- ***Step 5***
  High temperature catalytic hydrogenation in three reactor stages then removes sulphur, chlorine, and, most importantly, any remaining carcinogenic species from the lubeoil. This key processing step also improves product colour and odour (final reactor exit conditions 340°C and over 80s atmospheres).

- ***Step 6***
  The product is then split into 100 SN and 300 SN fractions (required by the blender market) in a conventional fractionation column. Yields are very stable reflecting consistency in the feedstock collection system and quality is indistinguishable from virgin product.

The plant is located in an environmentally sensitive area at the southern tip of San Francisco Bay. Apart from having to be a good neighbour to nearby residential property, it operates under an extremely rigorous permitting scrutiny maintained by the state and city authorities. It is the only fully permitted plant ie; inspected from new, of its kind in California; other collectors generally only having licences by virtue of longstanding operations on their sites.

Sales/marketing

In its early days, the Evergreen plant delivered very erratic performance principally due to the fouling that occurred in unexpected amounts in unexpected places. Unforeseen chemical reactions were occurring in addition to physical separation processes. This led to variability in product quantity and quality which clearly had to be reflected in a discounted price. This merely added to the image problem which has long plagued recycled lubeoil produced by generally unsatisfactory 'recycling' practices. Thus the new era of hydrogenated, quality, re-refined product was delayed somewhat whilst these prolonged teething trouble were resolved by the introduction of proprietary Mohawk pretreatment technology.

During this period, baseoil produced by the plant was sold, at a discount to virgin product, to blenders who used it in formulated lubricants but without declaring its origin. Now, with dramatically improved plant performance and a changed social attitude towards recycling in general, baseoil is sold virtually at parity with virgin material. In addition, formulated lubricants bearing the Evergreen name have been on sale in California for well over a year, proudly indicating their environmental origin. Grades produced include automotive, ranging from 10W/30 to 20W/50, Automatic Transmission Fluid (soon to obtain Dexron III approval), and hydraulic grades (ISO 32/46/68). A number of major US lubricants companies (Chevron, Unocal and Arco) have contracts to take Evergreen recycled baseoil for blending into their own branded environmental product ranges. It is worth noting, also, that in Canada Shell, Exxon and Chevron have been selling lubricants containing re-refined components for several years.

The lighter hydrocarbon stream resulting from the defuelling steps is used within the plant as fuel for process heating whilst some of the heavier distillate stream is sold as gas oil. The residual stream containing high molecular weight hydrocarbons and metallic compounds has a viscosity that makes it suitable for use as a bitumen flux.

Thus all the material collected for recycling achieves a commercial value for the second time in its life and in the case of the lubeoil molecules possibly more times than that.

Conclusions

With its proprietary process technology, this plant provides an example of commercially viable closed loop recycling in action.

Norway prepares for 14th World Petroleum Congress

By Susannah Cardy

Australia has entered the bidding for the year 2000. China has already secured a place in the history books for 1997. But next month it is Norway's turn to host what is still considered to be the oil industry's most crucial international forum – the World Petroleum Congress (WPC).

At this year's 14th WPC, the future of the US petroleum industry will be discussed by none other than Mr Constantine Nicandros, President and Chief Executive of Conoco. Next to take the rostrum to consider the state of the Russian oil industry will be Rosneft President, Mr Alexandr Putilov. Waiting in the wings will be Dr Subroto, ready to make what could be his last ever speech as Secretary-General of OPEC.

As always, the 2,000 or more oil executives who are due to converge on the small Norwegian city of Stavanger next month can expect to hear speakers of the very highest calibre. Other star attractions include Mr Helmut Werner, President and Chief Executive of Mercedes-Benz and Mr Serge Tchuruk, Chief Executive of Total SA. However, this impressive line-up of top oil celebrities constitutes only one small part of the WPC.

Unique event

The real 'meat' of the Congress, which takes place from 29 May to 1 June under the patronage of King Harald of Norway, is in the 90 technological papers. These focus on the nature, cost and impact of new developments and cover everything from 'Petroleum engineering challenges of the development of Precaspian depression fields' to 'Upgrading ethylene plant co-products'. In recent years, the scope of the papers has been expanded to embrace such areas as finance, economics and management. 'Every sector of the industry has its own conferences, but the Congress is unique because it pulls together all those separate areas to create an overall picture,' explained Mr Paul Tempest, Director-General of the WPC.

Key to the success of the Congress is the commissioning process for papers, which is strictly from the 'top down'. An International Scientific Programme Committee, chaired by Mr Dirk van der Meer, head of Shell's Amsterdam laboratory, selects a top global expert to chair each of the 23 separate technology forums. They, in turn, commission papers from the very best within their own sphere of interest.

Each speech is then subject to careful scrutiny for 'palatability' from two separate committees - one concerned with the text, the other with slides. Copies of the papers are then issued three weeks prior to the Congress, allowing delegates plenty of time to digest their content and prepare to debate with the authors.

If the speakers are kept on their toes by the WPC organisers, so too are the delegates. This is one conference where no one falls asleep during the graveyard slot. Forum speeches generally last no longer than 10 minutes, leaving an hour free for questions from the floor. For those visitors involved in more specialised areas, 50 extra papers will be presented in 'poster' format. The author then stands beside this enlarged version of his paper ready to discuss his views with interested parties.

The net result of all this careful thought and preparation is a very special Congress of unrivalled importance which, according to Mr Tempest, 'represents the most serious worldwide exchange of technology within the oil industry'.

Now held every three years, each Congress has a definite character of its

Stavanger, the 'oil capital' of Norway, is hosting this year's Congress

own thanks to the Olympic-style hosting arrangements. In Buenos Aires in 1991, President Menem's plans to open up Argentina to foreign competition meant that privatisation was a major theme (and one that is bound to continue at Stavanger). Beijing in 1997 will no doubt focus upon the explosive economic growth in the Pan-Asian-Pacific region.

With the Congress in Norway this year, it therefore comes as no surprise to find that the environment will come extremely high up on the agenda. The official theme of the 1994 WPC is 'Petroleum in a World of Sustainable Growth – Challenges and Opportunities'. According to Ms Gro Harlem Brundtland, Prime Minister of Norway and introductory speaker, this means finding a balance between the demand for energy to sustain global economic welfare and growth and the demand to protect our natural environment.

Norway's close proximity to the European mainland means that special attention will also be paid to Russia and the Former Soviet Union. Some 170 Russians alone are expected to come to Stavanger.

Alongside the official conference and accompanying exhibition, a great deal of extra-curricular activity will take place. A range of technical tours are on offer, as well as a full social programme. Perhaps most importantly, the Congress provides delegates with the perfect opportunity for consortia meetings and gives the private and public sector a rare chance to meet in informal surroundings. 'The WPC has a strong tradition for combining government and industry and a number of ministers will be present,' said Mr Tempest.

It is this tradition that has helped earn the WPC its rock-solid reputation. Set up by the Institute of Petroleum to promote the transfer of petroleum technology on a worldwide basis, the Congress is now over 60 years old and has spanned the globe, holding meetings as far afield as Bucharest, Mexico City and Tokyo. One of the most senior delegates, Professor Salvadori, has represented Italy at the WPC for over 40 years now. A Viennese choirboy at Archduke Ferdinand's funeral in 1914, this will be his 12th Congress.

Paul Tempest, Director General of the WPC

Growing membership

Mr Tempest puts the WPC's success down to its independent and non-political outlook, high reputation for advanced technology and its worldwide membership, which continues to grow.

The Congress gained six new member countries in Buenos Aires, while Kuwait, Cuba and Slovenia are expected to join in Stavanger, bringing the total to over 40.

Three members – Australia, Canada and Austria – are now competing to host the 16th Congress in the year 2000. Australia, the latest to make the offer, is hoping for a repeat of its successful Olympic bid. Meanwhile, China has put the Games behind it and is concentrating on what it likes to call the 'Oilympics'.

Plans for 1997 are already well ahead. The Great Hall of the People in Tiananmen Square, which has the capacity to seat 10,000, has already been booked.

Energy projects and Middle East peace

By J Roberts

The prospect of general peace in the Middle East is giving rise to a host of ideas for energy transfers and projects between Israel and its Arab neighbours and within the Arab world itself.

Israel and Qatar are holding what now appear to be a series of discussions on the long-term possibility of Qatari gas exports to Israel and thence, perhaps, to Europe. Egypt and Israel are also discussing a gas pipeline from Egypt to both Israel and Palestine. A cluster of Arab countries, including Iraq, are engaged in talks with Turkey on energy saving through a linkup of their various electricity grids, whilst Iraq and Jordan are considering plans to revive an Iraq-Aqaba oil pipeline project previously thwarted by Iraqi concerns at its vulnerability to Israel attack.

Egyptian gas for Israel?

In the immediate future, the most probable energy projects resulting from improved political prospects in the Middle East concern Egyptian gas deliveries to Israel and the Gaza Strip and regional electricity grid linkups. The Egyptian project can be undertaken at an early date because Egypt already has full diplomatic relations with Israel and because, by providing gas to the energy-starved Gaza Strip and possibly to the West Bank as well, the project would also help advance the Israeli-Palestinian peace process which is at the heart of the Arab-Israeli dispute.

For both political and commercial reasons, the Egyptian gas export project is likely to make rapid progress. Egypt's key role in the Middle East peace process – a role which is persistently under-estimated in the West – means that the Egyptian government has much to lose including, quite possibly, its very existence, should the Israel-PLO deal collapse. But to secure widespread Palestinian support for highly controversial accord with Israel that lays down a time-table for peace but which does not tackle either the physical or political limits of any prospective Palestinian entity will require rapid progress on the economic front. And that means, inter alia, the rapid provision of new energy supplies for Palestinian territories which have been starved of energy for both industry and domestic consumption.

Egypt's prime commercial concern is how to make the best of a limited resource base. Last June, the Deputy Chairman for Natural Gas of the Egyptian General Petroleum Corporation, Muhammad Tawila, said Egypt would need to possess some 26 trillion cubic feet(tcf) of reserves by year 2010 in order to meet its anticipated domestic demand.

Although Egypt does not currently possess such reserves, it is engaged in what appears to be a highly successful effort to discover fresh reserves. In the late 1980s, the reserve base rose relatively slowly, increasing by 20 percent between 1986 and 1990, when it reached 11.7 tcf. Since then, it has increased at a much faster rate. In 1992 it climbed to 12.9 tcf and on 1 January 1994 Oil Minister Hamdi al-Banbi announced that the country's estimated reserves now totalled no less than 21 tcf. Although Mr al-Banbi argued subsequently that this level of reserves was still insufficient to cover future domestic demand he did note that fresh discoveries meant there was still a possibility for exports.

'The Egyptian gas export project is likely to make rapid progress'

With Egyptian planners determined to encourage domestic gas consumption, thus freeing up oil for export, the key questions to be answered concern the extent of the surplus Egypt now enjoys, the length of time the surplus can be expected to last, and Egypt's capacity to ensure production outstrips domestic consumption.

Israeli requirements

Recent reports indicate that Israel is discussing imports of some two million tonnes per year. This is equivalent to around 210 million cubic feet per day and over a 15-year period, would entail the delivery of a total of 1.15 tcf. Tawila said in September that Egypt would need a 200-300 million cubic foot per day production surplus if it was to export gas to Israel. Egypt's own aggregate demand for the period 1993-2010 is estimated at 22.4 tcf, so, allowing for some leeway, the country does indeed require a reserve base of close to 26 tcf if it is to become even a modest exporter.

Perhaps the most important aspect of Tawila's 23 September comments was that he spoke of a gas line to Gaza and possibly Israel, placing the initial emphasis on the Palestinian territory. In recent months, almost all the focus has been on a line to Israel. But Gaza is en route to Israel from Egypt, it lacks indigenous energy, it is desperate for foreign assistance – and its development from urban refugee slum to commercial entrepot is considered crucial to the long-term success of the peace process.

For these fundamental reasons, coupled with Egypt's role as the principal Arab facilitator for Israeli-PLO negotiations, it is impossible to envisage any Egyptian gas deal with Israel excluding a link to Gaza. And given the energy

shortage on the West Bank, if commercial funding can be made available then almost certainly any pipeline to Israel would be extended to serve West Bank Palestinians as well.

The question of Egyptian gas supplies to the north was discussed in talks held between Italian President Luigi Scalfaro and PLO Chairman Yasser Arafat in early January. Mr Scalfaro, who said that Egypt intended to supply Israel with natural gas, became involved in the discussions because one of the principle gas producers in Egypt is a joint venture between the Egyptian General Petroleum Company and Italy's state-owned AGIP. One relevant factor is that AGIP has so far been selling its equity production to the Egyptian authorities to help them keep up with soaring domestic consumption, which for the last five years has kept pace with increased output. But if output can start to grow faster than domestic consumption, AGIP would be free to take its equity share in joint 3.3 mtpy output from the Abu Madi field, and subsequent output from its recent discoveries elsewhere in the northern Delta and offshore, and pipe it up to customers to the north.

Israeli economists at the University of Tel Aviv have estimated that it would cost between $70 million and $170 million, depending on size, to construct a gas line to Israel's Mediterranean coast. Israeli's Merhav group in late 1993 expressed an interest in constructing such a pipeline. A sister company of Merhav, Metropolitan Investments Corporation, is involved , together with Swiss and Egyptian investors, in proposals for a $900 million export refinery proposed for Alexandria. The Egyptian authorities approved this project last November. Israel would be a major market for the refinery, which would use oil provided by the Arab Petroleum Pipeline Company, which operates the Suez-Mediterranean (Sumed) pipeline.

Progress on electricity grid

Efforts to construct a viable regional electricity grid gained significant momentum in January, when senior energy officials from Iraq, Jordan, Turkey, Syria and Egypt met in Baghdad to discuss the grid. The aim is to save as much as $2-$3 billion in generating costs throughout the Levant through the construction of two international lines.

The first project envisages a connection from Cairo to Istanbul via Amman, Damascus and the central cities of Syria, while the second provides for a link extending from Istanbul to Baghdad. The Kuwait Arab Fund for Economic and Social Development is underwriting much of the cost of the project's first stage, the Egypt-Turkey link, which was discussed when President Hosni Mubarak and Egyptian Electricity Minister Maher Abaza held talks with their Turkish counterparts in Ankara at the end of January.

Mr Abaza termed the $450 million scheme 'one of the most important projects of the region.' Although not dependent on the peace process, it benefits from it in two ways. Firstly, Egypt, Jordan and Syria are all involved in the peace process, and the international community considers economic integration to be a disincentive to renewed conflict. Secondly, the long-term involvement of Iraq – though possibly not until Saddam Hussein is overthrown if Kuwaiti finance is also to be forthcoming for the second stage– would help reintegrate Iraq into regional structures.

'The eagerness of Israel to develop its energy and economic relations with its Muslim neighbours has sparked a host of somewhat premature declarations'

Turkey's involvement in the project makes it likely that at some stage there will be discussion of provision of electricity connections to Israel, while Egypt and Jordan can be expected to press for connections to the West Bank and Gaza in due course.

There is still considerable confusion concerning Israel's contacts with Qatar concerning possible deliveries of Qatari gas. The first of these contacts preceded the revelation in late August that Israel and the PLO were engaged in direct talks. Qatari Foreign Minister Hamad bin Jassef bin Jaba al-Thani has met at twice with Israeli Foreign Minister Shimon Peres to discuss natural gas deliveries. But the official Qatar news agency quoted him as saying in January that 'We have made it clear to Israel there will be no progress in our ties before there is big progress in the peace process and especially on the Syria and Lebanese tracks.'

Qatar gas deal?

Last October, Israeli Energy Minister Moshe Shahal said Israel expected to sign a 25-year gas supply deal with a Gulf emirate within two weeks. Amidst strong speculation that he was referring to Qatar, Qatari Energy Minister Abdullah bin Hamad a-Attiyah issued an immediate response, saying that 'regarding rumours quoting Israeli sources that an agreement will be concluded in the coming weeks between a Gulf state, which could be Qatar, and Israel for a project to construct a gas pipeline to Israel, HE Abdullah Hamad al-Attiyah, the Minister of Energy and Industry of Qatar, categorically denied the validity of these rumours, which he regarded as unrealistic and devoid of any logical basis.' The statement added: 'Any proposal along these lines has no factual basis as long as the Arab League Council does not take a decision rescinding its earlier decision on the Arab boycott of Israel.'

In effect, what seems to be happening is that Israel, which is in the middle of drawing up plans for increased reliance on natural gas, is pressurising Qatar to conclude an agreement in the near future while Qatar, which does not want to break ranks with mainstream Arab countries, is only prepared to say it is ready to consider an agreement in principle, but not to implement any physical project until it is clear that there will definitely be a comprehensive Middle East peace, including Syria, and not just a bilateral Israeli-PLO accord.

Despite various comments and reports indicating a possible pipeline from Qatar to Israel, with Mr Shimon Peres contemplating a land line via Iraq and Jordan, it is now clear that what is being discussed is LNG shipments to the Israeli port of Eilat. The Qatari Foreign Minister said after meeting Mr Peres in London in January that no feasibility study for the project has yet been undertaken. He restated Qatar's policy that it would not move on the project until the Arab boycott of Israel was lifted, but also expressed his country's willingness to work to lift the boycott.

Israel is reported to be willing to pay a significant premium to secure gas deliveries, with import costs estimated as high as $4.0 per million BTU. This compares with a recent calculation that Qatari LNG deliveries to Italy would be around $2.55 per million BTU. Israeli accounts have also spoken of connecting Israeli internal distribution of Qatari gas with existing European gas networks. This appears highly unlikely in view of construction costs for pipeline connections or the need for fresh facilities for outward LNG shipment across the Mediterranean.

It may, however, be worth speculating a little on where the Israeli-Qatari discussions might fit in with general Middle East energy arrangements in the medium and long term. The LNG proposal has the advantage of being an essentially bilateral arrangement. But in the event of a comprehensive settlement, then pipeline options embracing other countries will become viable. The suggestion by Mr Peres of a route

through Iraq – presumably a post-Saddam Iraq – would open the way for the provision of Qatari gas not only to Israel but to Kuwait (a former customer of Iraqi gas), Jordan and the Palestinian territories. There would also be options for connections to the Turkish gas grid which is already part of the European system.

The most likely prospect is that 1994 will therefore see Israel trying to pin Qatar down to a firm specific arrangement, while Qatar examines a variety of options which may or may not end up embracing Israel.

In considering the energy prospects opened up by progress towards Arab-Israeli peace, one factor should be particularly borne in mind; the eagerness of Israel to develop its energy and economic relations with its Muslim neighbours has sparked a host of somewhat premature declarations. Energy Minister Shahal not only proclaimed in October the imminent signing of a gas accord with an unnamed Gulf state but went on to make in November an equally premature statement that Israel had secured a gas delivery agreement within Egypt.

Pipeline prospects

Israeli reports have also suggested Iranian interest in reviving the Eilat-Ashkelon oil pipeline through which oil supplies from Imperial Iran used to reach Israel's cities. The government of what is now the Islamic Republic of Iran is still a co-owner of the pipeline and Israel is known to be interested in seeking its reactivation to serve not only Israel but other Mediterranean customers, so that the line would become a competitor to Egypt's Sumed system.

But if Israel is looking to a possible revival of its oil relationship with Iran, then neighbouring Jordan is likewise looking to a strengthening of its oil relationship with Iraq. In January, when the two countries renewed their agreement on soft-term Iraqi oil deliveries to Jordan, the two countries also agreed to reconsider the often-mooted project of an oil pipeline from Iraq to the Jordanian port of Aqaba. Jordanian Oil Minister Walid Asfur said such a project would not be implemented until after UN sanctions against Iraq were lifted and that it would include the construction of a refinery at Aqaba to serve both local and export markets.

Such a pipeline was seriously envisaged between 1983 and 1985, when Iraq, then at war with Iran, sought assurances from Israel that the line would not be subject to Israeli attack. Although top officials in the Bush administration worked to secure such assurances and also US export finance for the project, in the end Baghdad felt the security guarantees on offer were insufficient to meet its requirements and it opted instead for further expansion of the IPSA system through Saudi Arabia to Yanbu. Iraq's renewed interest in the project has almost certainly been triggered by its nervousness concerning its relations with its other neighbours. Pipeline outlets through Turkey and Saudi Arabia, closed at the outset of the Kuwait crisis in 1990, are still shut. The pipeline to the Syrian port of Banias and the Lebanese refinery at Tripoli has been closed since 1982. Baghdad itself took the decision to close the much older pipeline through Jordan to Halfa when the State of Israel was proclaimed in 1948.

Atmospheric emissions from the upstream oil and gas industry

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

This paper is about atmospheric emissions, which have been brought into focus by international concerns about global warming and the depletion of the ozone layer. The UK government, as a signatory to the UN Protocols and Conventions, agreed to develop methodologies to determine the size of atmospheric emissions and compile inventories of emission sources. To establish its own database and to assist the UK government in compiling a National Atmospheric Plan and a National Emissions Inventory, the UK Offshore Operators Association (UKOOA) commissioned Brown & Root Environmental to carry out a study in collaboration with the British Rig Owners Association (BROA) and the International Association of Drilling Contractors (IADC) to determine atmospheric emissions resulting from oil and gas exploration and production activities.

The objectives of this study were to:

- Develop methods for estimating atmospheric emissions
- Collect data on each source to allow calculation of the emissions
- Review methods of estimating fugitive leaks and develop a defensible methodology for calculating emissions from this source.

Operational data and information on individual sources were collected using a questionnaire developed in collaboration with the UKOOA Atmospheric Emissions Work Group. The detailed information allowed a best estimate to be made of emissions based on stoichiometric equations, mass balance or emission factors. Where possible, emission factors were derived from manufacturers' data, while calculations involving mass balances were based upon known operational parameters at individual facilities.

Contribution to UK economy

Atmospheric emissions from the upstream oil and gas industry should be viewed in the context of the huge contribution which the industry makes to the UK economy. In 1992 the upstream oil and gas industry invested over £10,000 million in exploration, operations and new developments:

- £5,300 million on new developments
- £3,300 million on operations
- £1,500 million on exploration

In spite of the sustained depression in crude oil prices, £1,600 million in taxes was contributed to the Exchequer. The industry employs 30,000 workers offshore and it is estimated that almost 300,000 workers onshore supported the offshore industry.

The upstream oil and gas industry is a huge business which, in 30 years, has grown from nothing to providing two-thirds of the total primary energy produced by the United Kingdom. Of the total production of 211 million tonnes (oil equivalent), oil and gas supplies 142 million tonnes (67.2 percent); coal supplies 50 million tonnes (23.7 percent); nuclear 17 million tonnes (8.1 percent) and hydro-electric 2 million tonnes (0.9 percent). It is in this context of the major primary energy provider in the United Kingdom that the emissions to atmosphere resulting from the exploration for and production of oil and gas should be viewed.

TABLE 1 – UPSTREAM OIL AND GAS EMISSIONS (1991)

Emission	*Quantity ('000 tonnes)*	*Total UK (%)*
Carbon Monoxide	41	0.6
Sulphur Dioxide	6	0.2
Nitrous Oxide	0.2	0.1
CFC	0.2	0.6
Halon	0.03	0.3

Source: UKOOA Environmental Study 1992

Emission of pollutants

The study carried out by Brown & Root provides for the first time a complete inventory of all atmospheric emissions. **Table 1** summarises the results for common pollutants such as carbon monoxide, sulphur dioxide and nitrous oxide; also ozone depletion chemicals such as chlorofluoro carbons (CFCs) and halon. In all cases the quantities of emissions are tiny and make an insignificant contribution to the total UK inventory of these gases. The manufacture of CFCs and halons are being phased out under the terms of the Montreal Protocol; so they will not be considered further in this paper.

TABLE 2 – UPSTREAM OIL AND GAS EMISSIONS (1991)

Emission	*Exploration*	*Production*	*Terminals*	*Total*
		('000 tonnes)		
Carbon Dioxide	408	16,492	2,075	18,975
Nitrogen Oxides	4	112	11	127
Methane	-	64	35	99
Volatile Organic Compounds	2	53	19	74

Source: UKOOA Environmental Study 1992

TABLE 3 – UPSTREAM OIL AND GAS EMISSIONS (1991)

Emission	*Quantity ('000 tonnes)*	*Greenhouse Factor*	*CO2 equivalent ('000 tonnes)*	*Total UK (%)*
Carbon Dioxide	18,975	1	18,975	3.2
Nitrogen Oxides	127	40	4,084	4.6
Methane	99	21	2,077	2.9
Volatile Organic Compounds	74	11	815	2.8

Source: UKOOA Environmental Study 1992

Emission of global warming gases

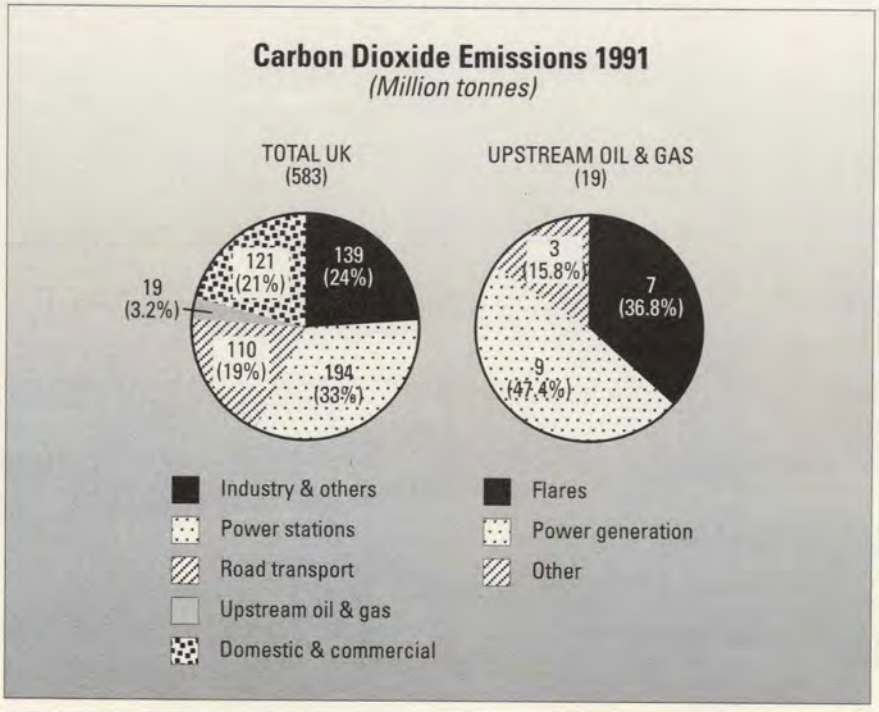
Table 2 summarises the results obtained for the so-called greenhouse gases, carbon dioxide, nitrogen oxides, methane and volatile organic compounds (VOCs) attributed to three sources – exploration, production and onshore terminals.

Carbon dioxide at almost 19 million tonnes is the largest emission, followed by nitrogen oxides, methane and VOCs. Most emissions result from production operations, with small but significant amounts arising from onshore terminals. Exploration does not generate a significant amount of atmospheric emissions.

The actual amount of these emissions does not give a useful measure of their global warming potential because a different 'greenhouse' factor can be allocated to each gas. (Carbon dioxide is used as the standard and, on this scale, nitrogen oxides are 40 times more potent and methane 21 times more potent in their global warming potential. To properly compare these effects, emissions of different gases are expressed as carbon dioxide equivalents.

Table 3 shows the actual quantities of emissions, the greenhouse factor and the carbon dioxide equivalents for the four main global warming gases. The chart also shows the percentage contribution of the upstream emissions to the total UK inventory. It is evident that this contribution is very small at around 3 percent.

FIGURE 1

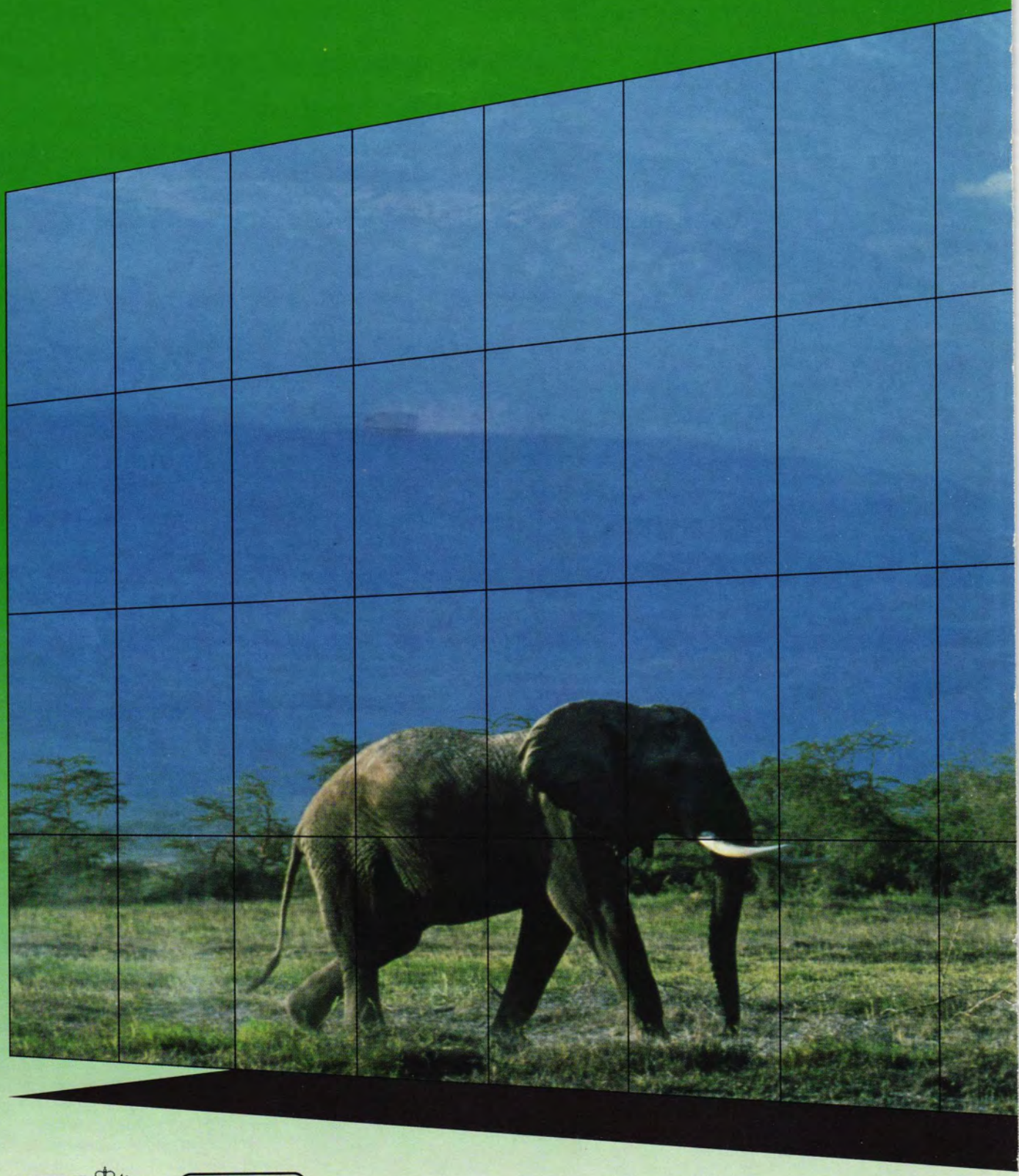


Carbon dioxide

As well as estimating the quantity of each emission, the study identified the precise source. **Figure 1** illustrates the sources of carbon dioxide emissions from the upstream sector contrasted with the total emissions from the whole of the United Kingdom. Carbon dioxide is produced whenever fossil fuel energy is burned so the major sources in the United Kingdom as a whole are power stations (33.3 percent); industry (23.8 percent); road transport (18.9 percent); domestic & commercial (20.8 percent). As consumers of power we all make a contribution to these emissions when we heat and light our homes and drive our cars.

The main sources of carbon dioxide emissions in the upstream oil and gas industry are power generation and flaring. To produce two-thirds of all the energy in the United Kingdom requires large amounts of power. Some oil production installations generate enough electricity to supply a small town. As the upstream industry continues to expand, power requirements will probably increase and therefore prospects for reducing this figure are low.

Flaring of gas is necessary for safety and operational control and cannot be avoided when there is no alternative outlet for relatively small quantities of gas. Gas can only be flared with the consent of the Secretary of State for Trade & Industry and is strictly controlled for the economic benefit of the



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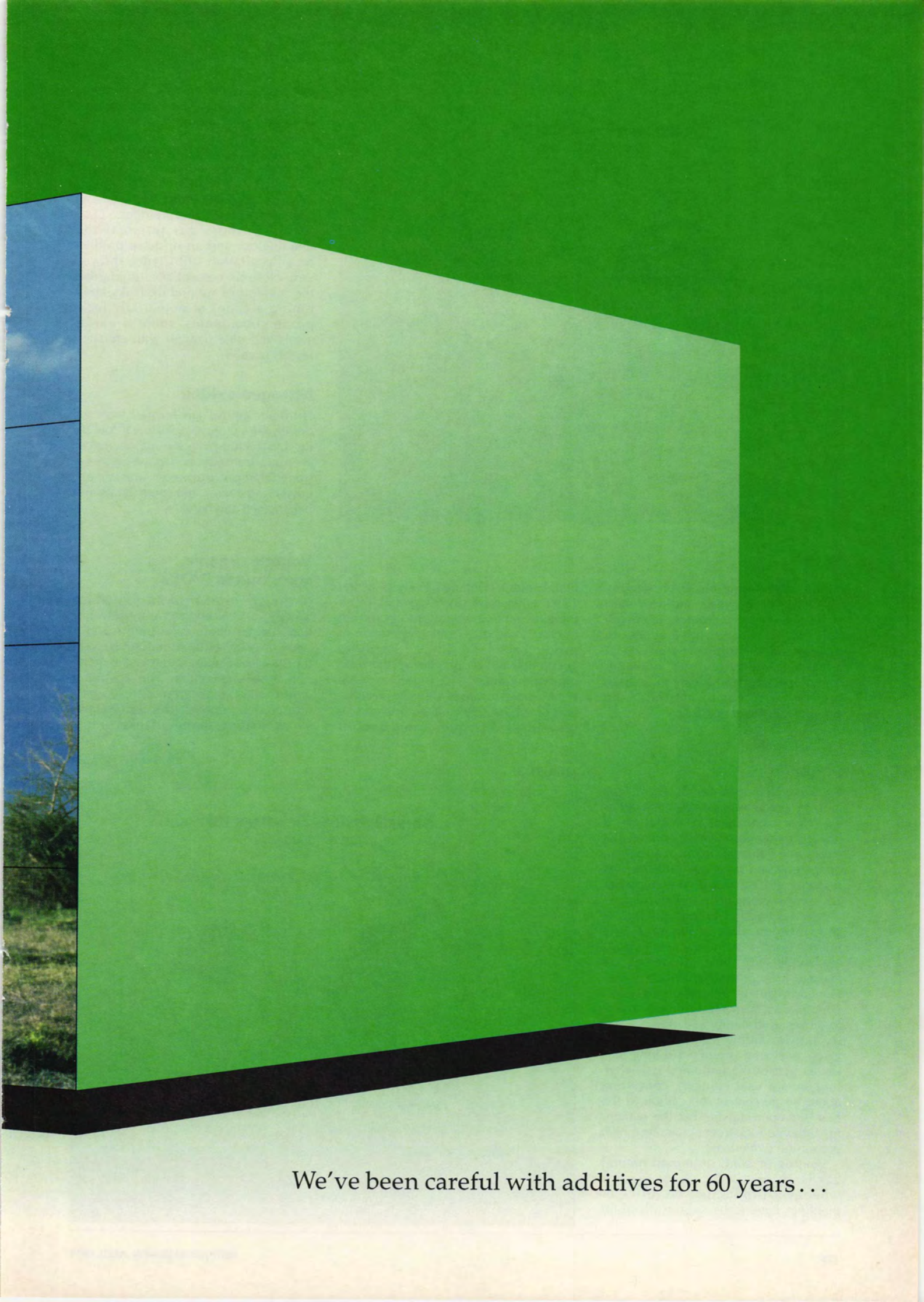

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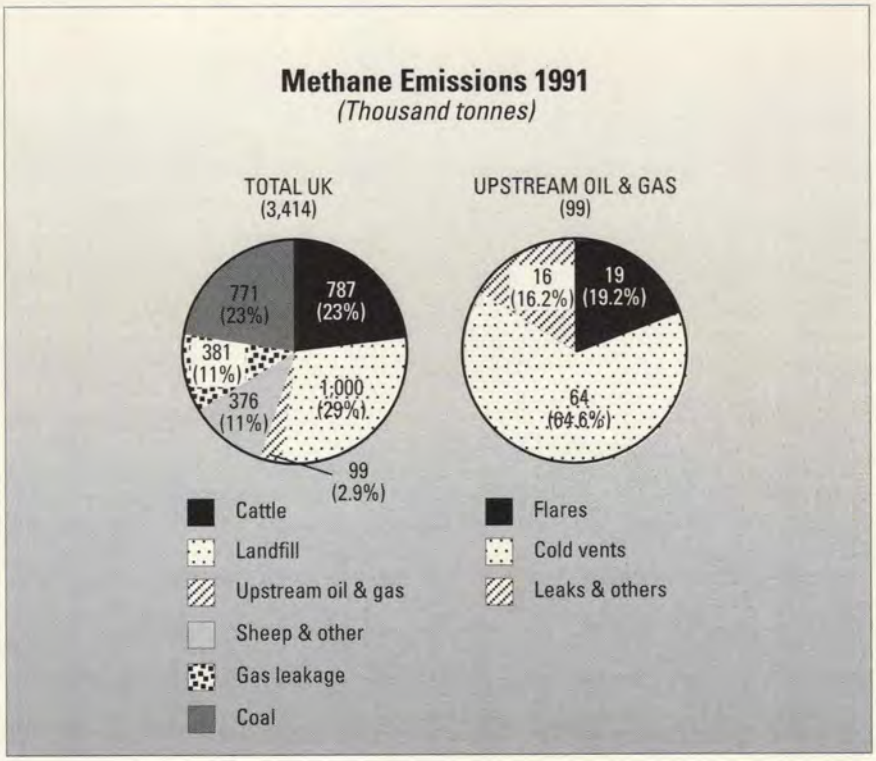


FIGURE 2

nation. Gas flaring has been steadily reduced over the years and now most of the gas flared is from isolated oilfields which do not have access to pipelines and no means of using or reinjecting the surplus gas economically. Operators are striving to manage the flaring of gas to minimise the amounts wherever possible.

Methane

Because the upstream oil and gas industry produces so much methane as the major component of natural gas, it has led many observers to believe that excessive leakage from production operations and pipelines offshore was responsible for a major contribution to UK sources of methane emissions.

This assumption is totally false, as shown by the data in **Figure 2**. The major sources of methane emissions are landfill sites, cattle, coal mines, gas leakage from onshore distribution systems and sheep. The relatively small contribution from the upstream industry arises from flaring and venting. The reasons for flaring have already been given. Methane is emitted during flaring as part of the unburned gas. Flare burners are very efficient. converting about 98 percent of the carbon in the fuel to carbon dioxide but the remaining unburned 2 percent contains a high proportion of methane.

Venting of cold, unburned natural gas is necessary for safety reasons whenever production facilities or pipelines have to be depressurized for maintenance. Detailed analysis of the 1991 emissions revealed that three pipeline venting operations at onshore terminals and one venting operation of production facilities offshore accounted for 30 percent of the total methane vented. The pipelines were depressured to allow the safe installation of subsea safety valves and can be viewed as infrequent and one-off events. Only 16 percent of methane emissions offshore arise from fugitive leaks and other sources.

To confirm that the international emission factors used to estimate fugitive leaks were valid for UK facilities, a number of separate studies were carried out to compare the estimated values with actual measurements. Data for an onshore gas terminal (BP Dimlington) and an offshore production installation (BP Clyde) showed very close agreement confirming that the method of estimating leaks combining a count of potentially leak-prone components, such as valves stems and pipe flanges, with emission factors is valid.

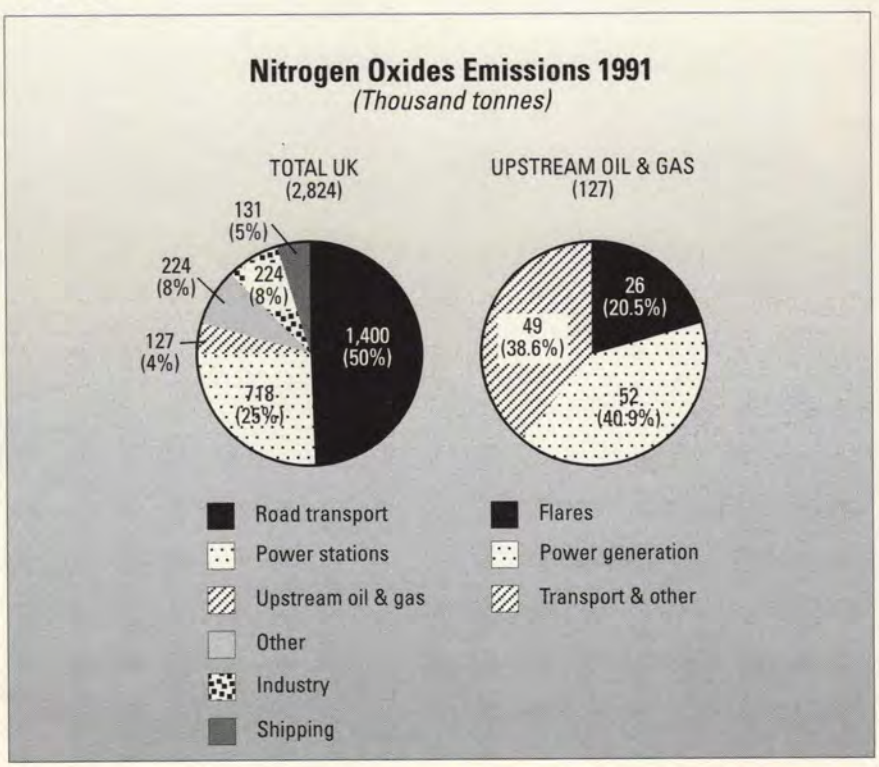
Nitrogen oxides

Nitrogen oxides are formed from air during the combustion of fossil fuel. In the United Kingdom the major sources are road transport and power generation. Offshore the main sources are power generation, transport (boats and helicopters) and flares.

Volatile organic compounds (VOCs)

In the United Kingdom the major sources of VOC emissions are solvents, used in the chemicals, paints and a wide diversity of other industries; road transport and many other commercial and business sectors. The upstream contribution arises from flares, vents, transport and storage. This includes offshore floating storage, tanker trans-

FIGURE 3



portation to the onshore terminal and unloading of cargo.

Comparison with Norway

Great attention has been paid to atmospheric emissions in Norway, because of the upstream industry's relatively high (20 percent) contribution to the total Norwegian emissions. Reports published by OLF, the Norwegian equivalent of UKOOA, show that except for VOCs the emissions of global warming gases was generally lower than in the United Kingdom.

- Norway produces similar levels of oil and gas to the United Kingdom but from about half the number of gas and oil installations.

- The Norwegian gas production area is closely linked geographically and physically to a common pipeline infrastructure. In the United Kingdom gas production is widely dispersed with a diverse pipeline infrastructure.

Nevertheless the OLF reports provide a number of useful pointers towards emission reduction strategies which may be applicable to the UK upstream industry, and UKOOA and OLF are co-operating closely to understand these better.

Future outlook

Total production of oil and gas is forecast to grow from 142 million tonnes of oil equivalent in 1991 to around 156 million tonnes in 2000. This increase will occur against a backdrop of a decline in production from older oil and gas fields and increasing production from a large number of newer, smaller fields. Forecasting emission levels for future years is very uncertain because they are not directly related to production but are related to the age, type and size of individual facilities. It is very likely, however, that the improved design of new facilities will lead to their having lower emissions than older installations.

Summary

As a result of a very detailed and comprehensive assessment of atmospheric emissions, the upstream contribution can be viewed in a total UK context. The industry produces 67 percent of UK primary energy but emits insignificant atmospheric pollutants and only 3 percent of the total UK global warming gases. This illustrates very well that the industry is managing its environmental affairs in a responsible and successful way.

The main sources of atmospheric emissions have been identified as vents, flares and power generation and it has been demonstrated that fugitive leaks do not contribute significantly. Indeed it would have been very surprising if fugitive leaks were shown to be significant because of the tremendous attention given to leak prevention for safety reasons. The industry handles huge quantities of inflammable gas at very high pressure. Leaks are hazardous and potentially dangerous, so good design, careful maintenance and sophisticated leak detection systems are used to eliminate leaks or at least keep them at minimum levels.

The contribution of the upstream industry emissions is a small fraction of the total United Kingdom and it is evident that, even if all the upstream emissions could be eliminated, it would not make a significant contribution to the reduction of the total UK emissions. Nevertheless the industry recognises that there is always scope for further improvement. In following up the study completed in 1993, UKOOA is considering potential strategies for achieving reduction in atmospheric emissions.

Emissions reduction strategy

In discussions with government, UKOOA has emphasised that when considering reduction strategies, the upstream contribution should be viewed in the total UK context. Reduction targets should be cost effective. There is nothing to be gained by spending huge amounts offshore to achieve very small reductions when a fraction of the expenditure on other major sources could result in very large reductions.

Nevertheless, the results of the UKOOA study have provided pointers for investigation and possible action.

Firstly, it is evident that efforts to reduce venting and flaring will continue. Operators do not like wasting precious resources for which there is a ready buyer so there is every incentive for operators to invest in improved systems which lead to reduced flaring and venting.

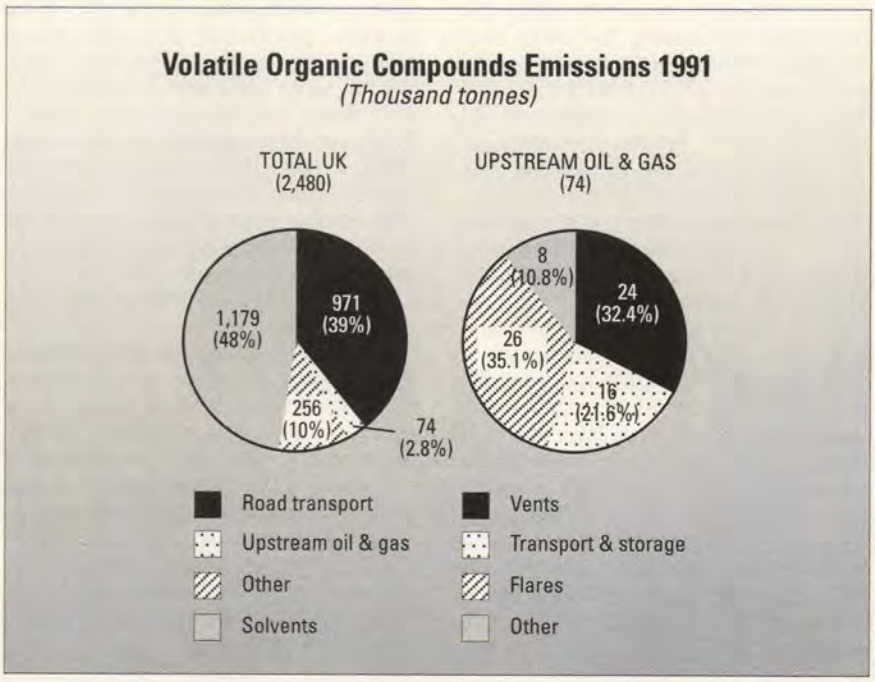
Secondly, it is environmentally beneficial to convert vents to flares where possible. By burning the methane vented to carbon dioxide its global warming potential is reduced by 20 times. Unfortunately it is not often possible or practical to convert vents to flares but a study is being carried out to determine to what extent it may be done and at what cost.

Thirdly, there may be opportunities to increase the efficiency of power generation offshore. The turbines themselves are very efficient but there may be increasing opportunities to arrange for power sharing between installations which may, in turn, enable other less efficient power generation equipment to be dispensed with.

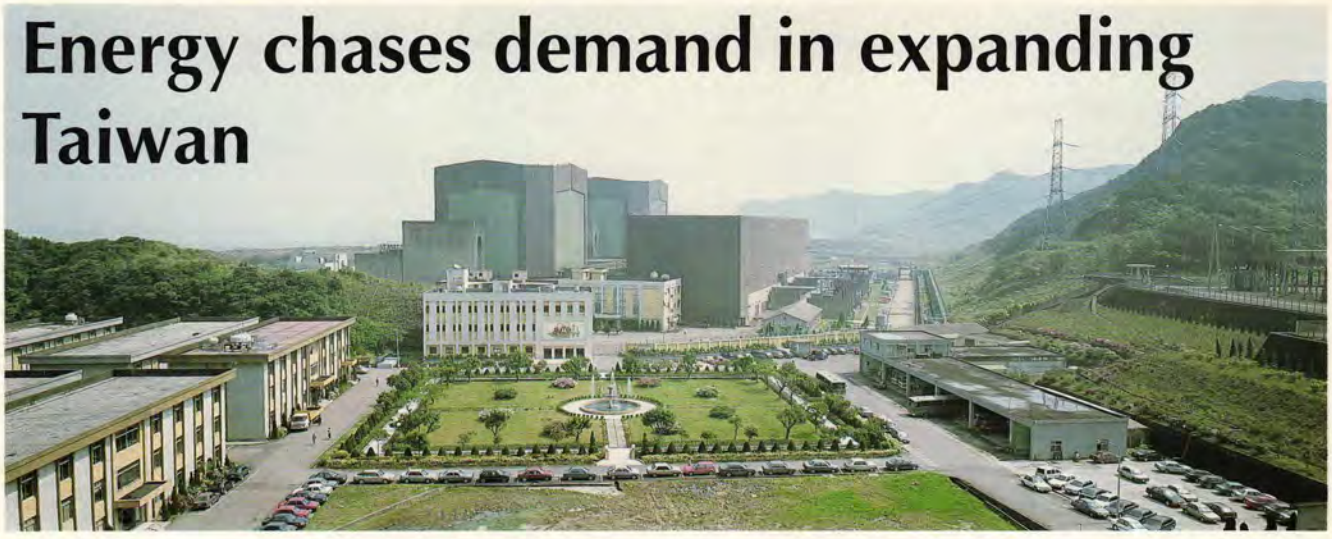
These avenues and possibilities will be explored in future and the upstream industry will play its part in the total UK effort to meet the commitments agreed in the Rio Summit.

This paper was presented to an IP conference on upstream atmospheric emissions held in February. In Dr Taylor's absence, the paper was presented by Mr HW Schipper, Senior Environmental Adviser, Shell UK Exploration and Production. He is chairman of the UKOOA Atmospheric Work Group.

FIGURE 3



Energy chases demand in expanding Taiwan



Taipower's second nuclear power plant in Taiwan

By David Buckman

A key component of Southeast Asia's onward expansion is the economy of Taiwan. While most countries in the world experience recession, Taiwan has surged ahead at the rate of 6-7 percent a year, because of aggressive implementation of the Six-Year National Plan. This has been achieved with negligible indigenous oil and gas production, land shortage and environmental problems and an energy industry that has yet to be fully liberalised and privatised.

Despite these problems the power industry remains in an expansionary mood and petroleum manufacturing looks set for big growth if only some of the mooted projects come to fruition.

Taiwan Power Company (Taipower) was set up in 1946 by the government of the Republic of China after the restoration of Taiwan. Currently 66.7 percent of its stock is owned by central government, 27.32 percent by the Taiwan Provincial Government, 0.1 percent by Taipei Municipal Government and the remaining 5.88 percent by institutions and individuals. As the sole power utility it is responsible for generating and marketing electric power to Taiwan main island and the offshore islets.

At the end of 1992 the Taipower system had a total installed capacity of 19.2 GW, with a net peaking capability of 17.8 GW by mid-1992. Demand is characterised by a very high daily load factor, a peak load of 16.7 GW having occurred on 30 July 1992, system reserve margin being 6.7percent. Taipower initiated its Rural Electrification Project in 1954 and the Offshore Islets Electrification Project in 1974. Almost all the population of around 21 million is now connected, with complete electrification expected 'in the near future.'

Taipower reckons that the generation system is 'well-balanced', with 13.4 percent of generation stemming from hydro stations, 59.9 percent thermal and 26.7 percent nuclear complexes. Abundant rainfall and steep stream gradients provide good prospects for hydro development; coal, oil and some LNG feed the fossil units; and there are three nuclear plants. Taipower envisages that by the end of 2001, if 1993-2001 Long-Range Power Development Programme is fulfilled, 'the system installed capacity will be 35.8 GW, comprising 19.9 percent nuclear, 28.1 percent coal, 24.5 percent LNG, 14.7 percent oil and 12.8 percent hydro.'

Behind this projection is the government's desire for energy diversification. Bulk demand will stem from power derived from coal-, nuclear- and oil-fired units, and coal imports will 'increase rapidly in the future.' To alleviate enviromnental impact and to diversify, increasing generation from LNG will also be considered, the amount of LNG 'expected to be increased from 500,000 tons in 1992 to 3 million tons in 2001.'

New power projects

A recent major development in Taipower's hydro-electric power programme is the bringing on stream of the Mingtan station. GEC Alsthom was awarded a £40 million order to supply six 400-rpm motors, each rated at 300 MVA, in August 1989, and the first was successfully commissioned in mid-1992, the five remaining units to be commissioned by September 1993. It is 'one of the largest plants of its type in the world.'

Taiwanese demand for foreign coal has grown impressively. Traditionally the country has bought coal mainly from Australia, South Africa, the United States, Canada, Indonesia and China, but new suppliers are always being evaluated. By 1990 demand for foreign coal had reached 18 million tons a year, having gone up 12 percent in that year. Oil has been imported from about 15 countries, including Saudi Arabia, Iran, Oman, Indonesia, Malaysia, the United States and Australia, and again there has been a wish to diversify. As a cushion against a supply cut-off Taiwan has carried a stock of over 100 days' demand and several years ago it decided to convert several tankers into floating storage units.

Of its almost 60 power stations three of Taipower's units are nuclear, but nuclear expansion has not been fast or easy. In its 1992 report Taipower notes that 'Society has become more complicated and diversified; power facility construction was often obstructed by some people; and environmental protection disputes were heard from time to time. All these have amde utility operations more and more difficult.' It

took almost a decade from the early 1980s when the proposal for a fourth nuclear station was mooted for the scheme to move ahead, overcoming government indecision and environmentalist opposition to a new plant at Yenliao, on the northeast coast. Land acquisition had been accomplished in 1983 but it was September 1991 before the Atomic Energy Council, the government regulatory body, approved Taipower's environmental impact assessment. The Council will closely monitor progress in meeting 41 requirements. Taipower says that commercial operation of the two units – the site could accommodate six – is 'scheduled for the years 2000 and 2001 respectively.'

There are prospects for partial deregulation of the power sector with the entry of independent operators who would construct, own and operate plants. Costs would be recovered by the sale of electricity to Taipower. It says that 10 sites have been chosen, initially for local investors, with foreign ones moving in later. Plants up to 750 MW are in mind, main hardware coming from foreign suppliers. Thus non-state agencies would carry the burden of tackling environmentalist opposition and they would help to find some of the cash needed. It has been estimated that to achieve 30 GW of capacity by end-century around $15 billion must be spent.

Alkylation unit at Kaohsiung refinery

LNG propects

Environmentalists should view more kindly the introduction of LNG. State-owned Chinese Petroleum Corporation (CPC), Taiwan's biggest enterprise, signed a first deal with Indonesia's Pertamina in 1987 to begin LNG imports, 1.5 million tons/year over 20 years starting in 1990. The 136,400-cubic metre *Ekaputra* was ordered by Cometco to be chartered to Pertamina, which added a fifth train to the Bontang liquefaction plant in East Kalimantan to cater for the trade. CPC set up Taiwan's first LNG receiving terminal at a cost of $1.27 billion at Yung An. Before it had started work, however, CPC was predicting that the 4.5 million t/yr, which it had an option on from Pertamina and which it originally thought would be achieved around end-century, was too conservative a figure. It would be attained earlier, so CPC decided to expand Yung An for about $700 million. The company now says that the expansion is 'under way and will be completed in 1997, for a total capacity of 4.5 million t/yr'.

In 1992 CPC took 28 shipments totalling 1.64 million tons from Indonesia. Late in that year it struck another deal with the Indonesians, boosting the 1.5 million t/yr by a further 750,000 tons, raising crude oil supplies from 50,000 b/d to 200,000 b/d and coal imports to just over 3 million tons from 2.6 million. With demand for LNG growing apace, Taiwan lately called for Pertamina to add eight cargoes worth 460,000 tons in 1994.

For several years CPC while talking with Pertamina was eyeing potential LNG imports from Alaska, Canada, Australia, Malaysia and Qatar. Thus in 1992 it signed to take 2.25 million t/yr from the Ma]aysian state firm Petronas, starting in 1995. The most recent deal stems from a]etter of intent signed with Ras Laffan Liquefied Natural Gas Co of Qatar. Under this CPC will take 2 million t/yr, with first deliveries plalmed for 1998.

About a year ago CPC began an evaluation, reckoned to last for about three years, to ascertain the future industrial and domestic requirements for LNG. However, it is expected that by the end of 1993 a definite picture will be formed as to how many ships will be needed if CPC moves towards using its own tonnage. China Ship Building Corporation would be a favourite for any orders, having a licence from France's Gaztransport to build such ships.

Now CPC is reported to be eyeing a second LNG receiving terminal, in the north, modelled on Yung An, if government and other approvals can be obtained It might be ready early in the next century.

Although Taiwan has a burgeoning need for gas and is heavi]y dependent on oil, its own production of both fuels is negligible set against need. Crude oil demand jumped from 270,000 b/d in 1982 to 590,000 b/d in 1992, although in 1992 consumption was only up 2.5 percent.

ICI's 350,000 t/yr Taiwan PTA plant under construction

Exploration

CPC conducts an optimistically active exploration programme, with approaching 600 km of seismic, 250 sq km of geological surveys and six exploratory wells achieved onshore in 1992. As LNG imports have risen so indigenous land gas output has been decreased. In 1992 gas production from 86 wells was about 85 million cubic feet a day plus some condensate.

The offshore search has concentrated off southwestern Taiwan, where the CFS 3 well, one of six in 1992, yielded just over 5 million cubic feet a day. CPC promised development if more wells proved encouraging and recent reports indicate that drilling has produced good results. The CBK field in northern waters went on stream in 1986, yielding 4,000 b/d of oil and 35 million cubic feet a day of gas but CPC says that it is in decline.

From the early 1980s CPC, under the banner Overseas Petroleum Investment Corporation (Opic), moved its search abroad. By the end of 1992 it had been active in joint ventures at 13 sites in seven countries.

Already there have been returns. In Indonesia, for example at the onshore Sanga Sanga concession, acquired by CPC in the name of Opicoil America not long through the successful merger with Huffco, eight exploration, 71 development and 69 completion wells have been drilled. CPC says that in 1992 through its 16.67 percent working interest in the concession 'we obtained 2,080,000 barrels of condensate oil and 470 million cubic metres of gas.'

In Ecuador Opic holds a 31 percent stake in block 16, where operator Maxus is readying Bogi field production for startup in the first quarter of 1994 and where about 215 million barrels have so far been found. Partner Murphy says that the initial flow will be 10,000-15,000 b/d, ising to 50,000 b/d in 1995. The fields Amo, Daimi, Ginta and Iro will later be tied into the export system.

One cloud overshadowing potential offshore Taiwanese exploration is who owns what. In February last year China passed a law reasserting its sovereignty over, with the right to use force to defend, three groups of islands, the Spratlys, the Paracels and the Senkaku chain. The Spratlys are also claimed by Vietnam, Taiwan, Malaysia, Brunei and the Philippines. Taiwa and Vietnam have claims on the Paracels, and the Senkaku chain is disputed with Taiwan and Japan. Another threat to offshore explorers is piracy. In 1991, for example, the International Maritime Bureau logged over 100 attacks in Southeast Asian waters. The pirates usually operate at night, using speedboats, looking for valuables and costly, removable equipment.

Downstream

Territory problems plague the domestic downstream industry, too. The claims on Taiwan's limited land by industry are considerable. The Yung An LNG terminal originally called for reclamation of 75 hectares of land and the need to obtain a suitable site for refining and petrochemical plants is a constant problem. CPC operates two refineries with a combined topping capacity of 600,000 b/d. Kaohsiung refinery in the south supplies two-thirds of total domestic demand for prdoucts and basic petrochemical raw materials. Taoyuan refinery has a topping capacity of 130,000 b/d to supply the north.

A 200,000-b/d grassroots third refinery has long been planned to cope with rising demand, and recent reports indicate that CPC – in line with a number of state firms for privatisation by breakup, then selling off the component parts – plans to set up a joint venture company to build it. CPC would hold about a third of the equity, local and foreign petroleum firms the rest. As for a site, CPC, admits that 'most of the plains areas in Taiwan are utilised to the saturation point, and it is becoming even more difficult to acquire a proper piece of land for construction of new units.'

'Land has become so expensive in Taiwan that it may be hard to justify a project economically,' says Antonio Chong, chairman of USI Far East Corporation, the big Taiwanese polyethylene producer. The feasibility of new plants might depend on government willingness to aid additional coastal sites.

Overseas sites are an option, although CPC said mid-1993 that it had suspended plans to invest in a $1.3-billion refinery in Malaysia. Guam was another location being eyed for a refinery about three years ago. More recently Taiwanese interests have been evaluating the potential of the Philippines' Subic Bay Naval Base, a 300-hectare site destined to be an industrial development zone following the exit of the American navy. It was suggested as the site for a fifth naphtha cracker for CPC.

Petrochemicals

Taiwan's petrochemical industry is a major component of the country's fast industrial growth. Plans for new plants continually emerge – witness the coming on stream of ICI's 350,000-tons/yr pure terephthalic acid (PTA) complex, formally opened last year. The £150 million plant, the company's largest investment in the Asia Pacific region, was built to cater for demand second only to that of the United States. Taiwan's need for PTA could overtake American needs in the next few years, and ICI tells *Petroleum Review* that the local company 'is thinking of doubling the capacity by early 1997.'

Raw material for Taiwan's prosperous downstream petrochemicals business mainly stems from CPC. It shut down its aged No 1 naphtha cracker in 1990 and now has 845,000 tons/year of capacity from crackers 2,3 and 4. No 5 is being built at the main complex of Kaohsiung refinery at Tsoyin, 'scheduled for completion in February 1994." CPC tells *Petroleum Review* that "it will not only add another 400,000 tons/yr of ethylene but will reduce our operational costs by the latest design in environmental protection and energy conservation.' Environmental battles had to be fought to get permission for No 5. CPC explains that it 'pledged to reserve the No 2 cracker for emergency use only upon completion of No 5, in exchange for the consent of local environmentalists, so that the the estimated ethylene capacity by then will only be mildly increased to 1,015,000 tons/'year, lagging far behind the actual growth rate in domestic demand.'

Taiwan's biggest naphtha cracking complex, number six, will be built by Formosa Plastics Group (FPG) at Mailiao on 1,950 hectares of state-owned land. The unit will produce 1.35 million tons/year of ethylene and will be accompanied by a 14 million tons/year refinery and many downstream units.

The $8.45-billion project should be on stream in 1998. FPG – the first private company to carry out such an upstream petrochemical development – originally proposed its scheme in 1986. Along the way it encountered many problems: in land purchase, tax, financing and getting industrial water. In 1991 the company drew up contingency plans for a $4 billion complex in China but this idea was later dropped.

A seventh naphtha cracker has been proposed for Taiwan by the Tuntex Group. It has in mind a 280,000-b/d refinery and an 800,000-tons/yr ethylene unit plus downstream units. The $5 billion development would be sited close to FPG's complex, and Tuntex has been negotiating to buy 400 hectares of land. The government has urged Tuntex to combine with CPC, which is eager to expand. It has announced a preliminary project that would embrace two new naphtha crackers, each able to produce 450,000 tons/yr, along with the third refinery. How interests in these ongoing developments will eventually shake down may take some time to resolve.

The Control of Major Accident Hazards (COMAH) Directive

A new European Union Safety and Environmental Directive is about to appear. It will require UK legislators to introduce regulations which will replace the existing Control of Industrial Major Accident Hazards Regulations (CIMAH).

Major hazards legislation in the United Kingdom was spawned in the early 1970s following the Flixborough explosion. The Notification of Installations Handling Hazardous Substances Regulations of 1982 (NIHHS) was the first of such legislation. Other major incidents worldwide at about the same time also indicated there was a need to introduce legislation to ensure that 'high risk' industries are managed and operated safely. A major chemical release at Seveso in Italy (after Flixborough) which had horrific off-site consequences led to the EC 'Seveso Directive' from which the 1984 CIMAH regulations were produced.

The Health and Safety at Work Act gives powers to the UK Health and Safety Executive (the factory inspectors) to 'police' those high risk industries.

There are in excess of 250 CIMAH or 'top tier' sites in the United Kingdom. These include oil refineries, chemical works and some of the larger petroleum storage depots. Top tier companies must demonstrate the safety of their operation by the production of a 'Safety Report'. The report identifies possible accidents and contains details of measures taken to reduce or eliminate the identified risks. CIMAH also requires the local authority to have an Off-Site Emergency Plan in the event an on-site accident adversely affects the neighbourhood surrounding a CIMAH site.

The bottom tier sites are covered by the NIHHS regulations.

Most readers of *Petroleum Review* will be familiar with the requirements of CIMAH and it will be generally known that in 1990 the Council of Ministers called for its fundamental review. This was because the directive was seen to be complex and difficult to implement. The directive made no reference to land use planning. Whilst there was an environmental requirement it was also felt that CIMAH did not go far enough on environmental safety. (There have been several amendments to the original directive to reflect lessons learned from other major catastrophic incidents such as Bhopal (1987) and the Sandoz Swiss warehouse fire (1988) but no major fundamental changes have been made until this time).

The technical details of the review were agreed in Brussels in late 1991 and the Commission of the European Communities (CEC) adopted the proposal in January of this year. It expected that a Common Position will be agreed by the autumn of 1994 and the Council of Ministers will adopt the Directive in the spring of 1995. Once the proposal has been formally adopted as a Directive member, states will have some 12 to 18 months to implement legislation to meet the new requirements. The HSE expects consultation to commence in the United Kingdom sometime in 1995 with the new COMAH regulations becoming UK law in late 1996.

Whilst COMAH is very similar to CIMAH, there are a number of differences.

COMAH places a greater emphasis on safety management systems and auditing both for top and bottom tier sites. Some of the other main differences are:

- The scope will be extended to include chemical hazards within the nuclear industry and explosives.
- There is no distinction between process and storage. Application will depend on the presence only of the threshold quantity of the dangerous substance.
- There is a greater use of generic categories (where there were over 170 named substances there are now only 10 generic categories and 30 or more named substances).
- An 'ecotoxic' category has been introduced, initially only aqua-toxic substances were included.
- There is a requirement to notify the enforcing authority of a dangerous substance at the bottom tier level.
- Members of the public must be consulted in the formulating of off-site emergency plans and there is a requirement to test the plans with the local authority (this will strengthen the existing requirement to review them now under CIMAH).
- The 'Domino Effect' between neighbouring sites must be considered.
- COMAH will call for more efficient reporting of major accidents to the HSE and then on to Brussels.
- Land use planning is included.
- A mechanism for keeping abreast of new technology has been introduced and will include more detail to ensure uniform implementation by members states.
- Member states will be required to set up a system for inspecting installations.

At a recent seminar organised by the Petroleum Training Federation, HSE Principal Inspector Ron De Cort of the Hazardous Installations Policy Unit at Bootle said that no new reporting is required for those installations already subject to either CIMAH or the Notification of Installations Handling Hazardous substances regulations (NIHHS). He also said that any company which has a Health and Safety Policy under the Management of Health and safety Regulations should not find this part of the COMAH regulations a particular problem. However it must be emphasised that COMAH is also an Environmental Directive and some companies will have to make their own fundamental review of their policies.

The HSE plan to produce guidance on the implementation of the new regulations when the UK legislative process commences.

VMC Morgan,
Safety and Security Coordinator,
Gulf Oil Great Britain
and Chairman, IP Safety Committee

New Zealand royalties scheme under fire

By William A Scholes

The Maui offshore oil and gas reserves are set to decline in the next decade. But the New Zealand government's scheme to make exploration more attractive to foreign investors has met with a chilly response.

The Maui condensate/oil/gas field which supplies the bulk of New Zealand's petroleum product is scheduled to deplete early next century and will need to be replaced, presenting a challenge to the industry. However, the government's scheme to encourage investment and development opportunities in the oil and gas industry was universally criticised by delegates at the 1994 New Zealand Petroleum Conference.

The theme of the conference, convened by the NZ Ministry of Commerce and the Petroleum Exploration Association of New Zealand (NZPEA), was 'The Post Maui Challenge – Investment and Development Opportunities'.

Energy Minister Doug Kidd officially opened the conference. He was appointed following the re-election last November of the National Government. He is also Minister of Labour and Minister of Fisheries.

Following the announcement of the government's plan, the NZ$1.5 billion a year oil and gas industry will push for lower royalties and greater incentives for companies to explore frontier areas.

Mr Kidd told the biennial conference in Rotorua last month that the petroleum programme, setting out policy for the allocation and management of oil and gas, was expected to be in force about September.

Royalties too high

The planned petroleum royalties involved either a 5 percent royalty charged on the net sales revenue from oil and gas or a 20 percent accounting profits royalty on profits in the course of a developed project. The permit holder would have to pay the higher of the two in any one year, Mr Kidd said. These payments would be on top of any company tax. The idea was that the new regime would be 'fiscally neutral', costing the industry no more than the present system.

The NZPEA Executive Director, David Crawford, said that the new accounting profits royalty (APR) was too high. He pointed out that the industry calculated the accounting profits royalty should be about 15 to 17 percent rather than the government's estimated 23 to 25 percent.

The industry also argued that there needed to be greater incentives to encourage overseas oil and gas explorers into New Zealand to find new reserves to replace Maui gas, due to run down from 2010, especially in unexplored frontier areas outside Taranaki.

Mount Taranaki looms over the Maui development

The new petroleum programme proposes allocating exploration permits quickly once a company makes an 'acceptable offer' including a commitment to a work programme in frontier area. Mr Crawford said that, to encourage exploration, the royalty regime should be varied for frontier areas, for example reducing the 5 percent sales royalty to nothing in the first five years. The regime needed to reverse the downward trend in overseas exploration interest in New Zealand.

Cash bonus bids

Mr Kidd said the two other methods for getting exploration permits under the new system would be to give the permit to the bidder with the best exploration programme – the present method.

There would also be 'cash bonus bidding' where there was a high level of information about a highly prospective area and keen competition was expected.

A call for public submissions would be made on the draft programme in about May. Industry players would have 40 days to make submissions.

More oil and gas needed

Finding another Maui oil and gas field was now a matter of urgency, Fletcher Challenge Ltd Chief Executive Hugh Fletcher told the conference.

He believed the present lack of offshore exploration was deplorable.

International investment must increase now, given that lead times were long.

He advocated:

- A relentless drive to improve skills, to increase the probability of exploration success.
- Higher and certain gas prices for any successful find.
- Lower and certain royalties for any success.

'New Zealand has not moved far enough or fast enough as it must to compete,' he said. 'We need further reductions in disincentive to invest.'

He advocated government royalties no higher than 10 percent on net profits from onshore finds and no royalties for offshore or 'frontier area' finds.

His company rejected the commonly held overseas view that New Zealand had low prospectivity and that the New Zealand market for natural gas was saturated.

Slash gas take-off

A spokeswoman from the Energy Ministry said that at present the government royalty on both gas and petroleum was 12.5 percent, imposed on the final price of the product. The government also collected 11 percent in 'carried interest'; it put in 11 percent of development money and collected 11 percent of the profits.

In his address to conference, Mr Crawford said about 80 percent of the industry's exploration money came from overseas.

Exploration in New Zealand was regarded internationally as running from medium risk in the Taranaki Basin to high risk in other areas.

The government had previously sought a 'maximum return' oil regime and by seeking a fiscally neutral transfer was effectively continuing this, he said.

Oil and gas royalties reap the government about NZ$45 million a year.

The proposed change would see existing licences continuing to operate under the old regime with the government holding an 11 percent commercial interest and taking a 12.5 percent ad valorem royalty based on wellhead production.

That 12.5 percent royalty has been widely criticised as an obstacle to marginal drilling.

Permits issued under the new regime would see explorers paying the greater of a 5 percent ad valorem royalty on net revenue or 20 percent of accounting profits from oil and gas production.

The 5 percent royalty would ensure a minimum basic return to the government, while the 20 percent of profits would mean it shared in a lucrative strike or substantial price rises.

Discourage investors

Mr Crawford said the 20 percent profit alternative would discourage investors. The association has said that figure should be halved to be internationally competitive.

The new regime has three methods of exploration permit allocation.

A cash bonus bidding system would see areas with particularly high prospectivity auctioned. This approach has been criticised as being disadvantageous to small local operators.

The option of awarding licences on the basis of the best work programme submitted would be retained.

And in offshore areas, where it appeared there was little or no competitive interest, it is proposed that exploration permits be allocated as a result of receipt of an acceptable frontier offer.

Mr Crawford suggested that based on recent oil exploration commitments in New Zealand, the government might be better advised to extend the frontier status to some onshore areas outside the Taranaki Basin and offer a lower rate of royalty charges to attract exploration capital.

He also favoured the government's selling its 11 percent commercial interest in existing licences. There was a potential for conflict where the government was involved as both the regulator and a business partner.

More blocks offer

Mr Kidd said that, as soon as practicable following implementation of the new programme, he would offer further permit blocks covering both onshore and offshore Taranaki.

New Zealand's best hope for further major petroleum finds lay near the existing offshore Maui gas and condensate field, according to keynote speaker Professor Peter Odell.

Nevertheless, Prof Odell noted an overall pessimism among New Zealand exploration leaders and doubts that another field the size of Maui would be found. He added that he noticed the same pessimism about the value of the Maui field on his last visit 20 years ago. New Zealand was still failing to interest the oil exploration world in its potential. 'Apart from Shell and a few Australian companies,' he said.

Large numbers of independent US exploration companies were missing

Another speaker, Melbourne-based General Manager of Western Mining Corporation Ltd Ray Hutchinson, said more discoveries adjacent to the offshore Maui field were 'inevitable'. He advised exploration companies to keep looking in the same area. 'There's life in the old girl yet,' he said.

The Kupe South field, in the South Taranaki Bight, was a sizeable find and still due to be exploited. More such fields are likely to be in the vicinity, said Mr Hutchinson, who stands by a track record of successful predictions.

Press reaction

Mr Kidd was talking about ways to extract more government revenue from the oil industry – how to kill the goose that lays golden eggs, said The Independent newspaper in an editorial. Predictably, all this talk was scaring the goose off.

The paper said Mr Kidd's proposal for plucking the oil industry – a 5 percent ad valorem royalty on the oil or 20 percent of the company's accounting profit – amounted to a penal impost imposed by a super-greedy government with no apparent understanding of the dynamics of risky capital ventures such as oil and mineral exploration.

As a revenue gathering exercise, the proposed tax regime was so ham-fisted it might well produce for government a net loss – lower production levels, lower foreign exchange earnings, fewer jobs and diminished exploration effort.

Argentina savours success as future problems build up

By Maria Kielmas, Editor, Latoil

As the only Latin American country to have privatised both its state oil and gas companies, Argentina has been basking in praise for its market reforms from international institutional investors. In contrast to the tortuous passage through the national congress of the two laws enabling oil and gas privatisation, the sell-offs themselves went very smoothly. But the result has been the strengthening of the quasi-monopoly grip on the Argentine oil and gas sector by the former state oil company, Yacimientos Petroliferos Fiscales (YPF), while a handful of national oil companies control the remainder. After its sweeping victory in the October congressional elections, the government of President Carlos Saúl Menem holds the initiative both politically and economically and is pushing through a constitutional reform, including the possibility for the direct re-election of a serving president. The opposition Radical party is in such disarray that it had no option but to co-operate with the government on this reform. But euphoria about the Argentine energy industries or the economy in general could be a short-lived phenomenon. Although oil production has increased some 30 percent more than the average recorded over the last decade, exploration has plummeted and warnings that the country will become a net oil importer again by the end of the century come from national and foreign oil executives alike.

When the government of President Menem assumed office in June 1989 it faced a formidable task in setting the economy to rights. Annualised inflation was nearing 5,000 percent, the country was $5.3 billion in arrears on payments on its $63 billion foreign debt payments, the state oil and gas companies, respectively Yacimientos Petroliferos Fiscales (YPF) and Gas del Estado (GdE), carried an accumulated debt of about $10 billion, an attempt to elicit foreign investor interest into oil exploration under the so-called 'Houston Plan' had flopped ignominiously and oil production was 511,000 barrels per day (b/d) and falling, making the country a net oil importer. The greatest achievement of the previous government of President Raúl Alfonsín was to survive in office, despite continued rumblings from the military, and to transfer power to a democratically-elected successor. On the economic front it was a failure largely because of its inability to forge a common economic strategy with the country's dominant business interests, several largely family-controlled financial and industrial conglomerates. The Alfonsín government's strategy was to encourage export-led growth but domestic industry did not alter its favoured orientation towards the domestic market, encouraged no doubt by government subsidies of the financial and industrial sectors, inherited from previous military administrations, of $3 billion annually.

Despite employing an election campaign rhetoric which was sympathetic to the Justicialist (Peronist) party's traditional supporters in the labour unions, Mr Menem had co-opted a number of leading Argentine conglomerates, including oil companies such as the Bulgheroni family's Bridas, and the Gruneisen family's Astra, into financing his campaign and planning a future economic programme. As a politician who had carved out his career in the provinces, he was never a diehard statist on the oil industry and is on record in the 1960s as saying that private sector capital should play a major role in the Argentine oil industry. This is entirely in line with Argentine tradition where the provincial governments have tried to encourage private and foreign oil investment in an effort to maintain some independent power base against the central government in Buenos Aires. This is why YPF, when it was created in the 1920s, was never a total state monopoly, even though its architect, General Enrique Mosconi, dearly wanted it to be.

Economic stabilisation

In 1989 President Menem embarked on a series of stabilisation plans under four different finance ministers, which successively pegged wages, exchange rates, increased public utility tariffs, eliminated many import tariffs and limited or suspended state subsidies to industry. By the end of 1991 Argentina had embarked on a wide-ranging privatisation programme, had been readmitted to the international financial markets, a credit market reappeared again in the country and the government registered a fiscal surplus of $1.3 billion. But the shortcomings of finance minister Domingo Cavallo's economic programme were becoming obvious. Privatisation receipts have been used to repay short-term public sector debts, the programme recycled state assets at what critics charged were knock-down prices among a domestic oligopoly of a half dozen or so family conglomerates, while consumer interests, especially in the energy sector, were hardly taken

into account. Notwithstanding the creation of a number of state regulatory bodies in the gas and electricity industries, there has never been an example in Argentine legal history of a court deciding against a company and in favour of a customer.

Companies such as Pérez Companc, Techint, and the Soldati family's Cia. General de Combustibles (CGC) participated in major stakes in every one of the oil and gas field sales. Fields and exploration concessions were also awarded to Estenssoro Pepe Petróleos (EPP), a company created by YPF chief José Estenssoro.He claims he has no personal interests in the companies any more, his critics allege otherwise. With the notable exception of the oil trading groups, Marc Rich & Co., foreign investors were largely cool to the field privatisations saying that participating in the sale would mean forging an expensive 'entry fee' deal with the local oil sector.

Oil deregulation

Oil sector deregulation began somewhat precariously in 1991 with the sale of part of YPF's interests in various oil and gas fields. Accumulated receipts of $300 million after the first two phases of oilfield sales went to the national treasury in order to compensate for current account loss of revenue due to the elimination of import tariffs. Earnings and tax revenues from YPF equally were redirected to the current account, instead of paying royalties to provincial governments and making social security contributions. This created a vicious circle where in order to redress the balance and meet the state's obligations, the government needed more privatisation receipts. Various spokesmen from the opposition Radical party criticised the progressive dismantling of the state's economic interests, and questioned the probity and conflicts of interests of a number of the government officials and beneficiaries of the privatisation process. But pointedly the Radicals did not offer an alternative solution to the economy, largely because no alternative has been identified.

Laws enabling the privatisation of the state oil and gas companies spent the greater part of 1992 working their way through a reluctant congress. The upper house, the senate, where Mr Menem's party is in overall majority, quickly passed the bills, though the lower house, the chamber of deputies, needed considerable coaxing, including a post-privatisation cash payment to the YPF union and granting it control over the company's pension scheme. The most significant criticism was that the privatisation of YPF and GdE, under the terms outlined, would serve to create a quasi-monopoly private sector oil company in the form of a revamped YPF. This is what has happened.

When GdE was privatised into two transportation and eight distribution companies, YPF kept a 30 percent share in all of the privatised entities, on top of already controlling 60 percent of the country's gas production. Anti-monopoly measures incorporated in the gas privatisation law imposed restrictions on cross-ownerships between the transport, distribution and gas-producing companies but YPF's grip on the industry remains.

Gas exports to Chile

This has been demonstrated in the drawn-out negotiations over the construction of a new gas pipeline to Chile. Originally it was supposed to be an entirely private sector venture on both sides of the Andes. Since Argentina had surplus gas and Chile had a growing gas market as well as a relatively healthy economy, finance for the project was expected to be in place by the end of 1993. But YPF, before its privatisation, insisted on being a member of the consortium of Argentine companies which produce gas in the Neuquén Basin and which want to export to Chile. YPF first said it would allow gas from its giant Loma de la Lata field to be exported, then changed its mind.

Confusion over which gas will be exported continues to delay the pro-

ject, which already suffered a delay on the Chilean side when state-controlled Spanish and Italian gas companies who wanted to participate in the distribution side of the project, pulled out because of political scandals in both Spain and Italy. The most recent development in the project has been an agreement between British Gas and Distribuidora de Gas de Chile whereby British Gas will conduct a feasibility study on the distribution side. If the study turns out to be positive, finance may be in place by the end of this year.

As the gas debate rumbled on, YPF's management embarked on a wide-ranging public relations campaign to convince foreign investors that the company had changed into a profitable enterprise. The government originally planned to privatise YPF slowly to test the market's reception. But this process has hastened by President's Menem's political ambitions. He started a debate on constitutional reform which would include permitting the direct re-election of an incumbent president. If he was to fulfil his ambitions, he would need to demonstrate to a sceptical congress, where constitutional reform need a two-thirds majority to be passed, that he had some public support on the matter. The solution was to privatise YPF in one go, use the privatisation receipts to pay off the government's outstanding liabilities to state pensioners, all before scheduled congressional elections on 3 October 1993, to be followed by a referendum on constitutional reform. The ruse worked – YPF was sold off on the back of much market hyperbole and Mr Menem scored a landslide victory in October which virtually obliterated the Radical party from the political agenda. If the Radicals wanted to retain any voice in the political process they had no option but to co-operate with Mr Menem on the subject of constitutional reform, which in any case the previous Radical government tried and failed to push through in the 1980s.

'An economic timebomb'

But while the governing Justicialists dominate the political agenda, an economic timebomb is ticking away, its critics charge. Much of the problem stems from the Convertibility Law, introduced by Finance Minister Domingo Cavallo in April 1991. Under this law the peso is pegged to the US dollar. Money in circulation is backed by an equivalent amount in reserves, a strategy which is supposed to remove inflationary pressure. The government is not allowed to finance the fiscal deficit by printing money without sufficient reserves for support. But at the same time there is an upper limit to the foreign reserves which the government can hold if inflation is to be kept under control while monetary policy is controlled by the US Federal Reserve and not the Argentine government. While this law has squashed inflation in Argentina, the cost of living still rises as rents increase by some 150 percent annually. Equally the oil industry is suffering because operational costs are so high. At current oil prices it is uneconomic for companies to pay the average $500,000 to drill a 2,000 metre well in places such as the onshore San Jorge Basin. The average well productivity in Argentina is only some 56 b/d and the country, at least onshore, is really a mature oil province.

The result has been that although oil production in 1993 was predicted to rise to 32 million tonnes, some 30 percent above the average level recorded over the last decade, exploration has slumped. The domestic oil companies which bought into privatised oilfields have invested heavily in enhanced production techniques, financed usually by straight debt, contracted on the international markets, or some version of pre-financing or oil receivables deals. The companies are reluctant to go for share issues since they are unwilling to disclose corporate information in order to comply with stock market regulations or indeed to relinquish family control. In addition, these companies grew largely as service companies to the state sector in the 1960s and 1970s, and within a protected market. They have no tradition of risk taking and wildcat oil exploration is not their stock in trade. So while the government boasts internationally about its success in increasing oil output, a growing number of Argentine and foreign oil executives are predicting that the country will be a net oil importer by the end of the century.

Even YPF, which dominates the industry, is no longer exploring but appraising around existing fields. The company's future prospects are fundamentally fragile. It has managed to persuade its foreign shareholders that it made good profit after privatisation largely because of higher downstream earnings. This came about because YPF's ex-refinery prices were some 10 percent higher than its competitors, Shell and Esso. Although in theory the fuel market is deregulated in Argentina, this does not work in practice because geography makes it difficult for a competitor to penetrate the country without first establishing a huge back-up infrastructure. Gas producing companies have been negotiating for a doubling of gas prices from July 1994 when the gas market is supposed to be deregulated. But this is likely to cause a consumer outcry, just as the campaign for the 1995 presidential elections begins. The government may be persuaded to delay gas deregulation further. YPF's earnings are also exposed to any changes in the exchange rate.

If the government eases its economic policy and introduces more flexibility into the exchange rate, something which would require a change in the law, operational costs for the oil industry could fall considerably. But the costs of servicing an estimated $7 billion foreign debt accumulated by the private sector would escalate, forcing the domestic oil sector into an asset sale. This would undermine the entire credibility of the Menem/Cavallo economic programme not only because of any inflationary pressures which would ensue but also because it would rupture the concordat between government and business which are the basis of the entire economic stabilisation. Publicly the government's policy is clear: the convertibility law stays in place at least until the 1995 presidential elections and, given Mr Cavallo's enduring desire to grasp the presidency one day, probably afterwards. But the pressures are building up and a big crack in Argentina's success story is only a matter of time.

Algeria: a risk worth taking?

By Colin Barraclough and Carol Reader

Algeria's political crisis – which has cost the deaths of some 3,000 Algerians (and nine journalists) in two years – is endangering the energy sector and might even affect exports to Europe. When Islamic militants threatened to kill any foreigner remaining in the country after 1 December 1993, many western expatriates, many oil workers among them, fled for safety. Some were not fast enough: armed gangs have so far murdered 18 Europeans since the deadline expired.

The West – and Europe in particular – has a vital interest in stability in Algeria. Every year, the country exports 106 million barrels of crude oil and 16 billion cubic metres (bcm) of gas, mostly to southern Europe, making Algeria the third largest supplier of gas to the European Union behind Norway and Russia. Were anything to halt gas exports, for instance, there would be other competing suppliers ready and willing to fill the gap. Similarly, other suppliers of light grades of crude would snap up Algeria's current share of the market.

Yet the stability of this supply has been put at risk by Algeria's most serious political crisis since January 1992, when the army cancelled elections that the opposition Islamic Salvation Front (FIS) was poised to win. A military-backed junta disbanded the FIS, expelling its leaders and condemning 360 alleged militants to death. Since then, splinter groups have clashed with the authorities across the country. The appointment of hardline defence minister Liamine Zeroual as president in January has done little to appease the militants.

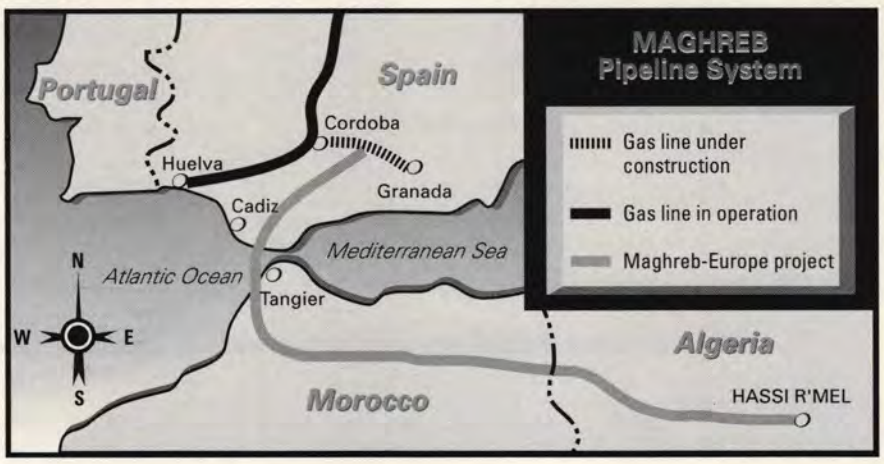
Algeria is now controlled by force of arms. Masked special forces officers career through the streets of Algiers in trucks bristling with weapons. Some 15,000 police have been drafted into the Algiers region alone to keep order. Amid the chaos, most Western oil companies have cut their expatriate staff, flying many back to Europe. The US government pulled half of its diplomats back to Washington, while those remaining use bullet-proof cars if they venture from the embassy at all. No Western company has yet closed down its Algerian operations but many are still refusing to re-deploy their staff until the threat of violence disappears. State-owned Sonatrach has remained intact so far – key officials remain in place and the oil is still flowing from the wells – but its infrastructure is in dire need of renewal. With the hard-pressed government hampered by a hard currency shortage and a dangerously high budget deficit, investment funds will have to come from overseas.

While his country is crumbling around him, Prime Minister Redha Malek remains confident that he can regain control of the political and security situations. Government ministers talk of retaking the political high ground by boosting the economy. 'Solve the economic problem and you solve the crisis,' said an official at the Ministry of Foreign Affairs in Algiers.

What is hindering them is the interest repayments on the country's $26 billion foreign debt and the fall in the world price of oil. Ninety-five percent of Algeria's income is derived from hydrocarbons; the country loses $500 million for every $1 fall in the world price for crude. The collapse in world prices last year pushed income down to $9.4 billion, barely enough to cover the $9 billion annual interest payments.

Mr Malek is pinning his hopes on a deal with the International Monetary Fund (IMF) to loosen the noose of debt repayments, while giving Algeria extended credit backing and international political support. In return, though, the IMF is insisting on substantial devaluation and reform of Algeria's cumbersome nationalised industries which the government, wary of exacerbating social unrest, is reluctant to make.

Most western oil companies are still waiting for some resolution of Algeria's political crisis. Many are considering sending their expatriate staff back to sites in the south of the country which has largely avoided the bloodshed of the more densely populated north. One



Source: J P Kenny & Partners Ltd.

option is to fly personnel direct to site, without landing at Algiers. But the long-term prospects for stability do not look good. As one western diplomat in Algiers said: 'There are absolutely no positive signs on the horizon. In fact, there is every reason to think the present situation will get worse.'

Emphasis on exploration

The on-going political crisis comes at a bad time for the oil and gas industries, which were previously planning considerable expansion. Not long ago, on the 30th anniversary of the establishment of Sonatrach in 1963, General Manager Abdelhak Bouhafs said, 'Sonatrach intends, on the verge of the 21st century, to engage in a process of modernisation and to open up the hydrocarbons sector to foreign companies'.

The company has drawn up a programme aimed at doubling its exports of natural gas from 35 billion cubic metres in 1992 to 65-70 million cubic metres by the year 2000. At the same time it plans to increase output of liquefied petroleum gas and condensate, while halting the decline in oil production. Crude output has dropped from 1.16 million barrels a day in 1978 to 771,800 b/d in 1992. Latest figures show crude exports at only one-third of peak levels.

The expansion programme includes the development of 11 gas fields already discovered southeast of Hassi R'Mel. Also part of the programme is the development of the Salah fields in the Reggan Basin in the south **(see box)**.

The quality of its crude and natural gas, its acknowledged potential for new discoveries and its location close to the European market made Algeria an attractive exploration area in recent years, once foreign companies were allowed back as partners with Sonatrach in production sharing contracts. Exploration activity has increased substantially, following the passing of the Petroleum Law in 1986 and subsequent modifications in 1991 and 1992 **(see Figure1)**.

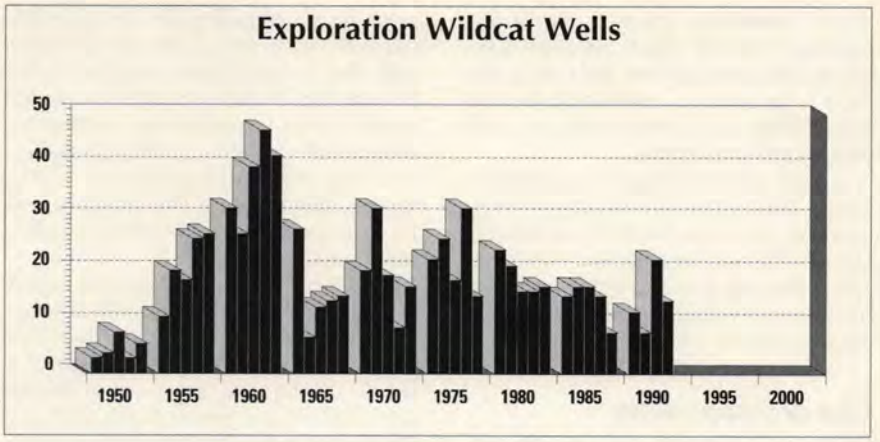


Figure 1 **Source: Sonatrach**

The newly created opportunities for partnership also extend to service companies – an Algerian private company and FORASOL (France) have formed a joint venture called FORASUD, while ENTP, an Algerian drilling contractor, and Deutag of Germany have formed another joint venture, DECO.

Discoveries have already been made recently by AGIP, Anadarko, BHP, Cepsa and Repsol. Mr Abdelmadjid Attar, Director, Exploration Division, Sonatrach, told Petroleum Review that one of the discoveries made by AGIP was expected to be in production later this year.

He said that there were now 20 foreign companies involved in Algeria and that by the end of this year this figure might well rise to over 30.

The foreign partners have been instrumental in introducing new technologies such as 3D seismic and horizontal drilling. New seismic surveys are now being carried out in both new and mature areas rather than reinterpretation of old data, while the first two horizontal wells have been drilled – at Hassi R'Mel and Hassi Messaoud, with more planned , especially for production use.

Enhanced oil recovery and field management are also being updated with foreign help, with the aim of increasing recovery from existing fields, both oil and gas.

The Algerian second licensing round opened in January and closes on 30 June. Considerable foreign interest is being shown in all the four blocks on offer, which includes acreage in the mature eastern province and the frontier area of the Tindouf Basin in the

BP IN ALGERIA

Algeria's political crisis has had a grave impact on the security of energy supply to Europe from North Africa. Most companies investing in the country or undertaking projects are re-considering the wisdom of operating in a theatre which many political analysts expect to degenerate into civil war.

BP, though, says it is determined to continue its operations in Algeria. 'We're still 120 percent committed to the country,' said a BP spokesman. The company is not daunted by working in areas of high political risk and has already sent its small expatriate staff back to Algiers.

BP is keen to exploit Sonatrach's ambitious plans for boosting hydrocarbon exports to Europe. It signed a production sharing agreement in January 1993 for the Sour-el-Ghozlane concession in the north of the country in what company officials admit was 'a bit of a gamble'. The 6,000 square kilometre area in the Tellian Atlas mountains is little explored; most other Western firms are set to explore sites grouped together in the east. BP's plans include shooting 500 km of seismic and drilling up to four wells on the concession. Since last December, though, a visit to BP's site from Algiers – a distance of only 100 km – now involves a lengthy detour around areas terrorised by the maquis, the armed militant gangs who roam the area.

BP is also exploring the Reggan Basin in the southwest – what it calls Region 3 – which it believes to contain significant gas reserves. The area is very little developed; indeed, it is little more than desert. BP has drawn up plans to build a 500 km pipeline from the site to join the existing pipeline network at Hassi R'Mel. BP-produced gas could then be connected directly to European markets through the newly constructed TransMaghreb and Trans-Mediterranean pipelines. In return, BP has agreed to complete commercial studies of the European energy market to assess potential areas of interest to Sonatrach.

In the meantime, BP is continuing to put a brave face on its future in Algeria. But if the situation does not improve, it too may have to reconsider.

west. Companies are attracted by the potential in these areas and are counting on the political and security problems to go away – admittedly there is less danger away from Algiers and other north coast towns.

In the long term there is considerable scope for more licensing rounds because, as a government spokesman said, of the total sedimentary basins of 1.5 million square kilometres, only half have been awarded, with the remainder open for future bids.

Gas developments

While the political climate deteriorates, work is still going ahead on the giant gas export pipeline from the giant gas fields at Hassi R'Mel via Morocco to Spain and Portugal. This is the Trans-Maghreb pipeline, scheduled to come into operation at the end of 1995. Construction work on the 530 km Algerian section has already been started by Bechtel, while engineers from JP Kenny and INTECSA of Spain are busy investigating the best possible route to cross the Straits of Gibraltar and the construction problems the contractor is likely to meet – water depths of up to 400 metres, strong bi-directional currents, a stripped seabed and the possibility of minor earthquakes and tremors. This pipeline will have a capacity of 8 billion cubic metres a year.

By 1996 Algeria will have gas export sales lined up totalling 56 billion cubic metres – and hopefully up to 60 billion cubic metres by the year 2000. As a result, the liquefaction units at Arzew and Skikda are being expanded. By 1996 their combined capacity will be 30 billion cubic metres a year.

At the same time the capacity of the exisiting 2,100 km Trans-Mediterranean gas pipeline from Hassi R'Mel through Tunisia and Sicily to Italy is being expanded from 16 billion to 24 billion cubic metres a year.

Yet it is difficult to see how such ambitious plans can continue without let or hindrance in the present climate. In early December, Malcolm Vincent, a British oil engineer working on the Trans-Maghreb pipeline, was murdered in Arzew. His company, Kellogg-Pullman, decided to pull out most of its expatriate staff shortly after.

Schlumberger followed suit by withdrawing its staff to Paris. Schlumberger began to charter flights directly to construction sites in the south when an urgent visit was needed.

Such measures may succeed in keeping a short-term presence in Algeria but it is difficult to see how larger scale plans can come to fruition when travelling in the country is so dangerous.

In light of the lack of safety guarantees from the Algerian government, Atlantic Richfield Company (Arco) and Total are both reconsidering negotiations to lease out Sonatrach's oil operations near Hassi Massoud. The talks have been dogged by Algerian demands for front-end bonuses but both companies are thought to have been influenced by the lack of security in the country.

Tanker firm puts emergency response to the test

Wincanton, a major operator of road tanker fleets, has instituted a programme of 'Test Emergencies', with the co-operation of its petroleum customers and the emergency services.

Because emergency response teams are rarely called upon to put their training into practice, Wincanton decided that the programme was necessary to keep their skills fresh. It also allows the company to monitor the effectiveness of procedures and highlight any areas that need updating.

A series of these 'dummy runs' have already been carried out by the firm , using both its own vehicles and customer fleets. Utmost secrecy surrounds each exercise – usually only Wincanton's Health and Safety Manager, together with the Distribution Manager from the oil company involved, are aware that the 'incident' has been planned. This ensures that as far as the driver and Incident Team are concerned, it is a genuine emergency.

A genuine emergency or a 'dummy run'?

The firm established its own emergency response capability back in 1987. Custom-built units hold all the equipment necessary to deal with a hazardous product incident and the facility is on the Fire Services' national call-out register.

The units are located strategically throughout the country. Each has a team of people who have received specialist training on the carefully-formulated set of procedures for dealing with hazardous cargo incidents. Drivers also receive training.

'The test exercises have proved to be of enormous benefit,' said Mr Alistair Elder, Managing Director of Wincanton's transport business. 'We have been able to demonstrate to our customers that they can have complete confidence in the company's ability to handle emergencies.

'The police and fire services have also welcomed this initative and have been extremely willing to provide support.'

Respirators for the petroleum industry

Specifically designed to combine high levels of respiratory protection with maximum comfort and simplicity in use, the 3M 4000 Series of gas and vapour/particulate respirators has been extended to meet the needs of the petroleum industry.

Independently tested to a new harmonised European Standard, the new respirators meet the performance requirements of HSE Approved Standard EN405 for valved filtering half mask respirators for use with gases or gases and particulate combinations.

As such, they are suitable for use in a variety of on and offshore applications and can also be used with other solvents such as those found in cleaning applications.

Designated the 4254 and 4257 Gas and Vapour/ Particulate respirators, the new additions feature a revolutionary low profile facepiece which can be worn comfortably with other protective equipment such as spectacles and ear defenders. They also incorporate a new exhalation valve design to reduce heat build-up inside the respirator and facilitate easier breathing.

Lightweight in design, the respirators also feature a soft, non-allergenic facepiece material which has been specially designed to reduce weight as well as possible skin irritation. The four-point strap and adjustable head cradle assembly provides a well-balanced fit for different head shapes and sizes.

Each of the 4000 Series respirators incorporates two single-piece carbon filters which eliminate the need for granule containers.

Eyebath and facewash fountain in one

Hughes Safety Showers has launched a new emergency eyebath/facewash fountain, which has been designed to suit a wide range of applications throughout industry.

Initially available ex-stock from RS Components for immediate delivery, the new unit is said to offer a host of technologically-advanced features including acrylic capped ABS base and lid, flow regulator, filters and aerated diffusers.

The cover is fixed directly to the water valve enabling the water to be turned on and off simply by opening and closing the lid. The water flow rate is fully adjustable allowing the fine mesh filters to dispense a gentle flow of aerated water.

The fountain is particularly suited to areas where dangerous chemicals are present.

Clean water for emergencies

Managing the health records

EO Associates have launched a new health and safety software programme designed for occupational health medical staff and departments.

'EOA - Occupational Health Supervisor' is an easy-to-use system for recording, monitoring and maintaining employee health data.

Information ranging from immunisation to issues of personal protective equipment can be recorded, while training and personnel sickness records can be interrogated, retrieved and analysed to generate trend reports. Statistics, reminder notices and other relevant data can also be kept.

A password-based security system ensures complete confidentiality of all records in the system.

The programme can be further expanded by adding an Accident/Incident Reporting module, which includes the facility to generate a completed form F2508 or F2508A, as required under the RIDDOR regulations.

Less drilling with new clean-up pump

The Solo 2 Inch pneumatic pump from Geotechnical Instruments cuts the cost of groundwater remediation and product recovery by fitting directly into 50mm wells.

Since 50mm boreholes are already present on many sites for the purpose of groundwater monitoring, the pump can in some cases completely eliminate the need to drill larger diameter holes solely for the purpose of remediation. If additional wells are needed, they are less expensive to drill and line.

Incorporating all the advantages of its parent – the Solo – this new, slimmer version features a Hammer Drive™ air control mechanism for maximum flow and reliability. The all-pneumatic powered pump can recover product at a flow rate of up to 2,000 gallons per day without cavitation or overheating and with minimal emulsification or foaming.

The pump runs without above-well timers or controllers. Inside its all-stainless steel and Teflon body, a float mechanism provides automatic level sensing and on/off functions. There is no need for the constant manual adjustment that some other pumps require. As it has fewer moving parts the Solo 2 is said to be more reliable than electric pumps and far safer in hazardous and flammable environments.

The pump is also economical to run – when the well level drops below the pumping level, it automatically shuts off.

A perfect fit

Live clean-up demonstrations

On 10-12 May 1994, Steptech Instrument Services will be one of four companies demonstrating a range of oil and chemical spill clean-up and environmental monitoring products under actual working conditions on the River Mersey.

Steptech will demonstrate the new Turner TD4100 Monitor, for the detection and measurement of oil in water.

The monitor incorporates NOCELL, a new non-contact flow cell and operates using the proven fluorescent detection system.

The new cell is said to allow reliable measurements to be taken without contaminated material coming into direct contact with the cell face, making the monitor suitable for handling a wide range of samples from those which are heavily laden with oil to clean water. 'This not only ensures more accurate measurements', said the company, 'but also minimises maintenance and virtually eliminates downtime'.

The other three companies taking part in the event will demonstrate a range of specialised equipment to control oil and chemical pollution, a waste disposal service specialising in oil and chemical clean-up, and high quality absorbent products for dealing with fluid spills of almost any kind.

Sliding fall arrest system

Led by the market demand to find a less restrictive fall arrest safety system for vertical ladders, and spurred on by new harmonised European Standards, Halfen Unistrut Limited have just launched SlideLock.

The compact SlideLock traveller has low friction runners which allow it to slide smoothly during normal climbing and descent. Should a fall occur the system positively locks into closely pitched slots in the rigid Arresta-rail running track.

Arresta-rail is provided with standard brackets to fix to most commonly found vertical or near vertical industrial fixed ladders. Bespoke designs are available to suit any application.

Some fixed ladders terminate at the landing level. The Arresta-rail can be extended above the top ladder fixing to allow users to step onto the landings whilst still securely attached to the system.

SlideLock has been tested to and complies with the recent European Standard BS EN 353-1: 1993, which supersedes the previous British Standard.

The conditioning tests include a performance check at low temperature and heat, exposure to oil and dust, together with tests for corrosion resistance and strength.

Installation is simple but Halfen Unistrut contracting teams can erect and test the system if required.

Building a roof over contaminated land

Much of the cost involved in decontaminating land is in the actual process of decontamination, but fringe costs, such as buildings to segregate contamination into zones, also mount up. Shelter specialists Jonsereds claim they provide a speedy, cost-effective solution to this problem.

Their shelters consist of a steel framework covered by a strong pvc flame-retardant fabric. They are easily erected and fully extendible. This means they can be relocated at any time.

They also have a translucent white roof which admits over 70 percent natural daylight, drastically reducing the need for artificial light.

Jonsereds has been providing shelters on the European Continent for many years. In Germany recently, a pipeline burst beneath the main motorway link between Berlin and South Germany. The crude oil spread into the motorway drainage system and built up in huge pools on the arable land. Jonsereds subsequently provided 7,000 square metres of shelters to cover the contaminated land.

Jonsereds' shelters are easily-erected and fully-extendible

Fire-resistant cabling passes the Esso test

A new range of offshore topside cable capable of withstanding temperatures of 1,100°C for up to one hour, is now available from ABB Control.

The Flex-Flame HCF range covers all topside platform cabling requirements from 250V instrumentation and telecommunication applications up to lOkV emergency power cabling.

Last September, The product was put through a series of stringent tests at Esso's Slagentangen Oil Refinery in Norway. The cable was first exposed to a naptha pit fire. It was still operating when the fire was put out after an hour.

In a second test, the cable was subjected simultaneously to a pit fire, a jet fire and regular dousing with high pressure salt water spray, designed to simulate the sea water used to extinguish fires on offshore platforms. This time, the cable failed after 22 minutes, exceeding the 15 minute figure Exxon specifies for cables exposed to hydrocarbon fires.

The cable costs more than standard fire resistant cables but it doesn't need the extra protection, such as rockwool and trunking, needed to give standard cabling similar resistance.

ABB cabling is put to the ultimate test at a Norwegian oil refinery

Bring your fork lift trucks indoors

Available from Engine Control Systems is EPS 2000, an exhaust purification system devised and developed by Calor Gas, which removes noxious gases from the exhaust emissions of liquefied petroleum gas-powered vehicles, making it possible to operate them safely inside buildings.

The system is said to reduce carbon monoxide levels from as high as 60,000 parts per million (ppm) to around 50 ppm at the exhaust pipe, well below the level required by Health and Safety Executive regulations. Moreover, all aldehydes, the cause of unpleasant odours, are removed.

Based on a catalytic exhaust purifier, it uses the special properties of precious metals dispersed over a metal honeycomb and encased in a tough stainless steel jacket. Through catalytic oxidation, the honeycomb converts carbon monoxide , unburnt fuel and incomplete combustion products into harmless gases and water.

Easy to fit, the system requires hardly any maintenance and should outlast not only the life of the exhaust system, but also the truck itself.

Slip-on safety sole

Spontex believes its new slip-on Safety Sole will make a significant impact in reducing accidents for those working on many types of wet, slippery or greasy surfaces.

The sole has been independently tested by SATRA, a worldwide leader in footwear research, whose report concluded that 'the results represented a good level of slip-resistance compared to conventional shoe soles'.

The high level of traction and stability is produced by thousands of grip edges built in to the flexible nylon-coated sole. These also help reduce muscle pain which is often caused by the tension of working on potentially hazardous surfaces.

Users have also reported that the sole cushions the feet and even proves effective as an eraser. In practice this means that stubborn marks are rubbed out, avoiding the need for the wearer to get down on his hands and knees.

To help maintain health and safety records, a simple, pre-printed Safety Awareness Certificate is included in every pack, together with comprehensive instructions.

Pollution control system launched

A new computer system has been launched to help petrochemical companies meet the requirements of pollution control legislation. Called IPC, the PC-based system is designed to automate much of the time-consuming administration and paperwork associated with Integrated Pollution Control under the Environmental Protection Act 1990.

Developed by Chester-based Calyx Environmental, the system records details for both Part A and Part B applications and subsequent authorisations. Key to the system is an 'automated diary' feature, which identifies and organises the legislative tasks into an orderly and accurate presentation. This provides the user with a complete picture of the work to be done within set timescales.

IPC has integrated databases providing instant access to information on authorisations, data returns, notices and accounts. Reports can be automatically produced for many aspects of the work, including regulators' release returns, upgrade requirements, notices, and summaries for site inspections.

CONTACTS

Wincanton	0963 338000
3M	0823 481248
Hughes Safety Showers	061 430 6618
E O Associates	0908 510034
Geotechnical Instruments	0926 338111
Steptech Instrument Services	0462 733566
Halfen Unistrut	0234 211331
Jonsereds	0234 327522
ABB Control	0203 368500
Spontex	0792 475544
Engine Control Systems	0635 871776
Calyx Environmental	0952 820155

FORTHCOMING EVENTS

April

5th-9th
Estoril, Portugal: '2nd European Congress on Economics and Management of Energy in Industry'. Details: ECEMEI, c/o Prof. Albino Reis, Rua Gago Coutinho, 185-187, 435 Rio Tinto, Portugal.
Tel: 351-(2)-9730747.
Fax: 351-(2)-9730746.

11th-12th
London: 'OPEC in Crisis: Oil Price Implications in the 1990s'. Details: CGES Conference Section c/o PCI, Coxmoor Lodge, Kirkby-in-Ashfield, Notts NG17 7HG.
Tel: (0623) 722 2213/4.
Fax: (0623) 722 216.

11th-12th
Aberdeen: 'Effectively Managing Optimum Offshore Safety'. Details: IIR Ltd. Industrial Division, 28th Floor, Centre Point, 103 New Oxford Street, London WC1A 1DD.
Tel: (071) 412 0141.
Fax: (071) 412 0145.

13th-14th
Aberdeen: 'Economically Developing the Northern European Deepwater Fields'. Details: IIR Ltd., 28th Floor, Centre Point, 103 New Oxford Street, London WC1A 1DD.
Tel: (071) 412 0141.
Fax: (071) 412 0145.

13th-15th
Luxembourg: 'The Possible Harmonization of European Diving Standards'. Details: European Diving Technology Committee Secretary, 177a High Street, Beckenham, Kent BR3 1AH.
Tel: (081) 663 3859.
Fax: (081) 663 3860.

17th-18th
Beijing: 'Special Offshore Symposium, China 94'. Details: Prof. Jin S. Chung, SOSC-94 Beijing Committee, ISOPE, PO Box 1107, Golden, Colorado 80402-1107.
Tel: 1 (303) 273 3673.
Fax: 1 (303) 420 3760.

18th-22nd
Leeds: 'Diesel Particulars and Nox Emissions'. Details: Miss Julie Charlton, Department of Fuel and Energy, University of Leeds, Leeds, LS2 9JT.
Tel: (0532) 332 494.
Fax: (0532) 332 511.

18th-22nd
London: 'Differential Satellite Navigation Systems'.Details: Judith Patten, Neville House, 55 Eden Street, Kingston upon Thames, Surrey KT1 1BW.
Tel: (081) 547 1566.
Fax: (081) 547 1143.

19th
London: 'Offshore Safety Case Management'. Details: Iain Dale, The Waterfront Partnership, Churchill House, 136 Buckingham Palace Rd, London SW1W 9SA.
Tel: (071) 730 0430.
Fax: (071) 730 0460.

19th
Aberdeen: Symposium on Pipeline Stability. Details: Chris Timbrell, Zentech International, 103 Mytchett Road, Mytchett, Camberley, Surrey GU16 6ES.
Tel: (0252) 376 388.
Fax: (0252) 376 389.

19th-20th
Bristol: 'Selling the Virtues of Oil'.Details: Petroleum Training Federation, Suite 1, Morley House, 314/322 Regent Street, London W1R 5AB.
Tel: (071) 255 2335
Fax: (071) 255 1828

19th-20th
London: 'Cost Effective Repair and Refurbishment of Bulk Liquid Storage Tanks'. Details: IIR Ltd., 28th Floor, Centre Point, 103 Oxford Street, London WC1A 1DD.
Tel: (071) 412 0141.
Fax: (071) 412 0145.

19th-20th
London: 'Renewable Energy-Its Commercial Exploitation'. Details: IBC Technical Services Ltd, IBC House, Vickers Drive, Brooklands Industrial Park, Weybridge, Surrey KT13 OXS.
Tel: (071) 637 4383.
Fax: (071) 637 4383.

20th
Bracknell: 'The Oil Partners Portfolio, best-practice management information solutions for downstream and upstream operations'. Details: Stefan Van Bogaert, ICL Major Companies Division, Observatory House, Windsor Road, Slough SL1 2EY.
Tel: (0753) 516 000.
Fax: (0753) 516 778.

20th
Aberdeen: 'Bruce Western Area Development – A Novel Contracting Strategy Put into Practice'. Details: Society for Underwater Technology, PSTI House, Exploration Drive, Offshore Technology Park, Bridge of Don, Aberdeen AB23 8GX.
Tel: (0224) 823 637.
Fax: (0224) 820 236.

20th-21st
Moscow: '3rd Annual Moscow International Oil & Gas Projects '94 Conference'. Details: International Trade and Exhibitions J/V Ltd, Byron House, 112A Shirland Road, London W9 2EQ.
Tel: (071) 286 9720.
Fax: (071) 286 0177.

20th-21st
Aberdeen: 'Applying Best Practices in Partnering to improve performance'. Details: IBC Technical Services Ltd., IBC House, Vickers Drive, Brooklands Industrial Park, Weybridge, Surrey KT13 0XS.
Tel: (071) 637 4383.
Fax: (071) 631 3214.

21st
London: 'Clean Coal Technology: How Soon a Threat to the Gas and Oil Industry'. Details: Caroline Little, The Institute of Petroleum.

25th-26th
London: 'The Offshore Oil and Gas Supply and Construction Market'. Details: Lynn Van Rooyen, IBC Legal Studies and Services Ltd., Gilmoora House, 57-61 Mortimer Street, London W1N 7TD.
Tel: (071) 637 4383.
Fax: (071) 631 3214.

25th-27th
Bahrain: GEO 94 – The Middle East Geosciences Exhibition & The AAPG Conference. Details: Arabian Exhibition Management WLL, P O Box 20200, Manama, Bahrain.
Tel: +973 550033.
Fax: +973 553288.

25th-28th
Limassol, Cyprus: 'The Fifth European and Middle Eastern Pipeline Rehabilitation Seminar'. Details: Susan Carradice, The Pipeline Centre, Farrington Rd, Rossendale Rd Industrial Estate, Burnley, Lancashire BB11 5SW.
Tel: (282) 415 323.
Fax: (282) 415 326.

25th-29th
London: 'Quality Control for Completions and Workovers'. Details: Oil & Gas Consultants International Inc., P.O. Box 35448, Tulsa, Oklahoma 74153-0448, USA.
Tel: 1 (918) 742 2334.
Fax: 1 (918) 742 2272.

26th-29th
Dubai: 'Britain in the Gulf '94'. Details: International Conferences and Exhibition Ltd., Cromwell House, 51-53 High Street, Kings Langley, Herts WD4 9HU.
Tel: (0923) 261 988.
Fax: (0923) 261 669.

FORTHCOMING EVENTS

27th-29th
Buckinghamshire: 'The Sixth European Gas Contracts Negotiating Workshop'. Details: Langham Oil Conferences Ltd., 37 Main Street, Queniborough, Leicester LE7 3DB.
Tel: (0664) 424 776.
Fax: (0664) 424 832.

27th-29th
Houston: 'Global Energy Industries: Forces Effecting Change'. Details: Harvard Business School Club of Houston, c/o International Meeting Managers, Inc., 4550 Post Oak Place, Suite 248, Houston TX 77027.
Tel: 1 (713) 965 0566.
Fax: 1 (713) 960 0488.

27th-28th
London: 'The Future of the Gas Industry in the New Competitive Market'. Details: Louise Pasha, IEA Conference Office, 56-60 St John Street, London EC1M 4DT.
Tel: (071) 490 3774.
Fax: (071) 490 2296.

27th-28th
London: 'Petroleum Trading and International Law'. Details: Abacus International, 214 Inchbonnie Road, South Woodham Ferrers, Essex CM3 5WU.
Tel: (0245) 328 340.
Fax: (0245) 323 429.

28th
London: 'Petroleum Retailing – Regulation and Competition'. Details: Caroline Little, The Institute of Petroleum.

28th
Aberdeen: 'The Third Offshore Installation Management Conference'. Details: Offshore Management Centre, The Robert Gordon University, Viewfield Road, Aberdeen AB9 2PW.
Tel: (0224) 263 104.
Fax: (0224) 263 100.

May

2nd-5th
Houston: '1994 Offshore Technology Conference'. Details: Offshore Technology Conference, P.O. Box 833868, Richardson, Texas 75083-3868, USA.
Tel: 1 (214) 952 9494.
Fax: 1 (214) 952 9435.º

5th
Aberdeen: 'Fifth Mike Adye Lecture – New Frontiers'. Details: The Marine Technology Directorate Limited. 19 Buckingham Street London WC2N 6EF.
Tel: (071) 321 0674.
Fax: (071) 930 4323.

9th-12th
Birmingham: 'IFSEC 94'. Details: Richard Pegler, IFSEC, Blenheim Group plc, 630 Chiswick High Road, London W4 5BG.
Tel: (081) 742 2828.
Fax: (081) 994 9735.

10th-12th
Birmingham: 'Control and Instrumentation Exhibition'. Details: MGB Exhibitions Ltd, Marlowe House, 109 Station Road, Sidcup, Kent DA15 7ET.
Tel: (081) 302 8585.
Fax: (081) 302 7205.

10th-13th
Singapore: 'Disaster At Sea: Preparing For and Managing Oil Spill'. Details: Pacific Rim Marine Focus, IIR, 89 Short Street, Suite 08-03 Golden Wall Centre, Singapore 0718.
Tel: (65) 338 3521.
Fax: (65) 336 4017.

11th-12th
London: 'Terminal Operation and Dynamic Measurement'. Details: Abacus International, 214 Inchbonnie Road, South Woodham Ferrers, Essex CM3 5WU.
Tel: (0245) 328 340.
Fax: (0245) 323 429.

11th-13th
Beijing: '1994 China Summit – The Socialist Market Economy of the PRC, 1994-2000'. Details: Vivian Peters/Fiona Irwin, International Herald Tribune Hong Kong Office.
Tel: 852- 9222 1176.
Fax: 852- 9222 1190.

16th-17th
London: 'Oil and Gas Software Development '. Details: The Braithwaite Group, Oil Soft House, 1 Gorse Road, Cookham, Berks SL6 9LL
Tel: (0628) 525492.
Fax: (0628) 521928.

18th-19th
Gatwick: 'Oil Pollution Control Conference'. Details: Trevor Holburn, Conference Secretary, Room 1/04A Spring Place, 105 Commercial Road, Southampton SO1 0ZD
Tel: (0703) 329 317.
Fax: (0703) 329 440.

19th-20th
London: 'Optimum Logistics in Oil Supply and Distribution'. Details: IIR Ltd.,Industrial Division, 28th Floor, Centre Point, 103 New Oxford Street, London WC1A 1DD
Tel: (071) 412 0141.
Fax: (071) 412 0145.

24th
London: 'All at Sea with Fuels and Lubes'. Details: Caroline Little, The Institute of Petroleum.

24th-26th
Edinburgh: 'International Conference on Pipeline Systems'. Details: Miss Tracey Peters, BHR Group Ltd., Cranfield, Bedford MK43 OAJ
Tel: (0234) 750 422.
Fax: (0234) 750 074.

24th-28th
Baku, Azerbaijain: 'The International Caspian Oil and Gas Exhibition and Conference'. Details: Spearhead Exhibitions Ltd., 55/59 Fife Road, Kingston upon Thames, Surrey KT1 1TA.
Tel: (081) 549 583.
Fax: (081) 541 5657.

28th-31st
Istanbul: 'International Petrol Station Exhibition'. Details: Expoconsult B.V. Industrieweg 54, PO Box 200, 3600 AE Maarssen, The Netherlands.
Tel: 31 (3465) 73777.
Fax: 31 (3465) 73811.

June

29th-1st June
Stavanger, Norway: '14th World Petroleum Congress'. Details: World Petroleum Congress, 61 New Cavendish Street, London W1M 8AR.
Tel: (071) 636 1004.
Fax: (071) 255 1472.

3rd-5th
Lae, Papua New Guinea: 'PNG Geology, Exploration and Mining Conference'. Details: Organising Committee GEM '94, PNG Geological Survey, Private Mail Bag, Port Moresby Post Office, Papua New Guinea.
Tel: (675) 212 422.
Fax: (675) 211 360.

8th-9th
London: 'Petroleum Trading and Measurement Accuracy'. Details: Abacus International, 214 Inchbonnie Road, South Woodham Ferrers, Essex CM3 5WU.
Tel: (0245) 328 340.
Fax: (0245) 323 429.

8th-10th
London: 'Financial Management & Accounting for the Oil & Gas Industry'. Details: Tom Jones, MD Consultancy, 18a Carden Place, Aberdeen AB1 1UQ.
Tel: (0224) 626268.
Fax: (0224) 626950.

8th-10th
Birmingham: 'Forecourt Shop & Convenience Retailing'. Details: Blenheim, 630 Chiswick High Road, London W4 5BG.
Tel: (081) 742 2828.
Fax: (081) 994 9735.

INSTITUTE NEWS

NEW COLLECTIVE MEMBERS

ABN AMRO Bank, 101 Moorgate, London EC2M 6SB.
IP Nominated Representative: Mr R B Harvey, Head of Special Projects Group

ABN AMRO Bank is a full service banking corporation with a strong capital base, a major position in both domestic and international markets, a wide variety of clients of differing size in many business sectors, and a large pool of highly qualified staff. They have a strong local presence in major markets throughout the world. The strength of the organisation generates not only great operating efficiency, but also substantial benefits for clients. ABN AMRO Bank offer its clients a large network of services and funding capacity.

Petro Vend (Europe) Ltd., 76 Leeds Road, Newton Bar, Wakefield WF1 2QF.
IP Nominated Representative: Mr Peter Fisher, Managing Director

Petro Vend (Europe) Ltd is involved in producing fuel dispensing systems, utilising card controlled access in both the diesel haulage business and the retail forecourt, together with tank gauge and environmental products.

Praxis plc., 20 Manvers Street, Bath, Avon
IP Nominated Representative: Mr David M Evans, Marketing Manager

Praxis is the software engineering company of Touche Ross Management Consultants and has a wide reputation for the development and integration of complex, business critical systems in petrochemicals. The company specialises in large databases, particularly those in hydrocarbon accounting area.

AB Malte Persson & Son, Bultgaten 6, S-30244 Halmstad, Sweden
IP Nominated Representative: Mr O Persson, General Manager

AB Malte Persson & Son is a family company with tradition and broad experience as a Swedish contractor who develop and manufacture their own products for pumps and filling stations. They are one of Europe's main suppliers of certified vapour recovery systems (Stage II) for the retrofit market, and safety breakwat valves for coaxial hoses.

AROUND THE BRANCHES

Aberdeen
12 April: 'Policing the North Sea', Dr Ian Oliver, Chief Constable, Grampian Police.
10 May: 'The Nelson Field', Mark Hope, General Manager Northern Operations, Enterprise Oil.

Humber
14 April: Ladies Night.
11 May: 'The MaK Engine', P D Coates, Krupp Mak (London) Ltd.

London
18 May: 'The Independent Petrol Retailers' Viewpoint', C K B Petter, Petrol Retailers Association.

Midlands
20 April: 'Petrol Retailing Through the Next Decade', David Rae, Q8 Petroleum UK.

The Netherlands
14th April: 'Oil & Gas Law in the Former Soviet Union – Recent Developments', Dr Peter Cameron, University of Leiden.

North East
22 April: Annual Dinner Dance.

Northern
11 April: Hot Pot Supper.

South Wales
26 April: 'Local Justice', Mrs Julie Ratti, Barrister.

NEW MEMBERS

Mr S A Adeleke, The College of Petroleum & Energy Studies, Sun Alliance House, New Inn Hall Street, Oxford OX1 2QD
Mr M O Ali, 317 Woodstock Road, Oxford OX2 7NY
Dr A A Al-Saggaf, Lube Oil Re-Refining Company, PO Box 31717, Jeddah 21418, Saudi Arabia
Mr L J Arslanian, 8 Foxwood, Parklands, West Derby, Liverpool L12 0HZ
Miss A Askwith, Taylor Joynson Garrett, Carmelite, 50 Victoria Embankment, Blackfriars, London EC4Y 0DX
Mr P D Atkinson, 5 Morningside Avenue, Blackhall, Inverurie, Aberdeenshire AB51 4FG
Mr C L Balseca, PO Box 5568, Guayaquil, Ecuador
Mr D J C Basham, Kleinwort Benson Securities, 20 Fenchurch Street, London EC3P 3DB
Mr C W T Begley, 118 Addiscombe Road, Croydon, Surrey CRO 5PQ
Mr J A Book, 13 St Augustines Road, Bedford MK40 2NB
Mr I B Brodie, Blackwell Energy, Blackwell Publishers, 108 Cowley Road, Oxford OX4 1JF
Mr K Brown, Bankers Trust Company, 1 Appold Street, Broadgate, London EC2A 2HE
Mr J W Brunton, Cargill International SA, 14 Chemin de Normandie, CH-1211 Geneve 12, Switzerland
Mr R H Burgess, 31 Albany Park Drive, Winnersh, Wokingham, Berks RG11 5HZ
Mr D Bybordi, Darius & Co, 65 Eyre Court, Finchley Road, London NW8 9TU
Mr P F Carr, 27 Gypsy Lane, Marton, Middlesbrough, Cleveland TS7 8NF
Mr R Chapman, 29 Hurst Lane, Bollington, Macclesfield, Cheshire SK10 5LP

UK Deliveries into Consumption (tonnes)

Products	*† Jan 1993*	** Jan 1994*	*† Jan 1993*	** Jan 1994*	*% Change*
Naphtha/LDF	333,605.0	299,908.0	333,605.0	299,908.0	-10
ATF – Kerosene	493,536.0	525,619.0	493,536.0	525,619.0	7
Petrol	1,791,377.0	1,704,544.0	1,791,377.0	1,704,544.0	-5
of which unleaded	897,714.0	944,649.0	897,714.0	944,649.0	5
of which Super unleaded	109,398.0	104,029.0	109,398.0	104,029.0	-5
Premium unleaded	788,316.0	840,620.0	788,316.0	840,620.0	7
Burning Oil	288,746.0	285,637.0	288,746.0	285,637.0	-1
Derv Fuel	873,213.0	897,579.0	873,213.0	897,579.0	3
Gas/Diesel Oil	729,886.0	675,494.0	729,886.0	675,494.0	-7
Fuel Oil	930,093.0	851,888.0	930,093.0	851,888.0	-8
Lubricating Oil	65,441.0	62,113.0	65,441.0	62,113.0	-5
Other Products	609,968.0	543,724.0	609,968.0	543,724.0	-11
Total above	**6,115,865.0**	**5,846,506.0**	**6,115,865.0**	**5,846,506.0**	**-4**
Refinery Consumption	549,265.0	579,280.0	549,265.0	579,280.0	5
Total all products	**6,665,130.0**	**6,425,786.0**	**6,665,130.0**	**6,425,786.0**	**-4**

*† Revised with adjustments *Preliminary*

INSTITUTE NEWS

Mr J Chisholm, 21 St George's Avenue, Harrogate, North Yorkshire HG2 9DP
Mr R Chocian, 81 St Catherines Road, Pound Hill, Crawley, West Sussex RH10 3TB
Mr A M Cochrane, John Brown E & C plc, 20 Eastbourne Terrace, London W2 6LE
Mr R T Cole, 8 Russet Close, Stanford-le-Hope, Essex SS17 8AH
Mr E A Collins, 14 Thackley End, Oxford OX2 6LB
Mr J S Coulter, 3 The Chase, Rickleton, Washington, Tyne & Wear NE38 9DX
Mr F Del Manso, Unione Petrolifera, Via Del Giorgione 129, Rome 00147, Italy
Mr D Drukarz, Fladgate Fielder, 3 Heron Place, 3 George Street, London W1H 6AD
Mr S El Derini, Tam Oilfield Services, 4 Guezira Street, Zamalek, Cairo, Egypt
Dr A Eva, 33 St John's Close, Saffron Walden, Essex CB11 4AR
Mr J V Falzon, Falzon House, Dr Zammit Street, B'kara, BKR 07, Malta
Mr P Fernihough, Fernihough Lubricants, The Furlongs, Holy Cross Lane, Belbroughton, Worcs DY9 9SJ
Mr D S Flukes, Oikos Ltd, Bowater House East, 68 Knightsbridge, London SW1X 7LT
Mr G Fradgley, 3 Forbes Chase, Meadowbrook, College Town, Sandhurst, Camberley, Surrey GU15 4FT
Dr W A Freeland, RGIT Survival Centre Limited, 338 King Street, Aberdeen AB2 3BJ
Mr I Fuchs, Mercur Superintending Co Ltd, 47 Ha'atzmauth Road, POB 628, Haifa 31006, Israel
Mr C F Gibson, Pine Lodge, Beaulieu Road, Dibden Purieu, Southampton, Hants SO4 5JD
Mr A G Gordon, 7 Binghill Park, Milltimber, Aberdeen AB1 0EE
Mr B Goulder, Automobile Association, Lister Point, Sherrington Way, Basingstoke, Hants RG22 4DQ
Mr K J Graham, Premier Storefitters, Ingram House, High Street, Girton, Newark, Notts NG23 7JA
Mr M A Haque, Seacom Shipping Ltd, Taher Chamber, 10 Agrabad Commercial Area, Chittagong 4000, Bangladesh
Dr A P Heward, 16 Derwent Close, Claygate, Esher, Surrey KT10 0RF
Mr B R Hewitt, 10 Prospect Park, Southborough, Tunbridge Wells, Kent TN4 0EQ
Mr R E Howard, Lornepark Engineers Limited, 15 Southridge Place, The Downs, Wimbledon, London SW20 8JQ
Mr J M Hudson, Lehman Brothers International, 1 Broadgate, London EC2M 7HA
Ms K Jarrah-Layegh, Oxford Institute for Energy Studies, 57 Woodstock Road, Oxford, Oxon OX2 6FA
Mr J Johnson, 47 Besant House, Boundary Road, London NW8 0HX
Mr M Johnson, Flat 5, 12 Portman Street, London W1H 9AS
Mr S T Jones, 8 Miller Road, Merrow Park, Guildford, Surrey GU4 7DG
Miss C Joyeux, Europe Energy Environment, 49 Hay's Mews, Mayfair, London W1X 7RT
Dr E Kamil, 23 Collieston Path, Bridge of Don, Aberdeen AB22 8LY
Mr G J Kamwanja, The College of Petroleum & Energy Studies, Sun Alliance House, New Inn Hall Street, Oxford
Mr P K Kariuki, The College of Petroleum & Energy Studies, Sun Alliance House, New Inn Hall Street, Oxford OX1 2QD
Mr F T Kelly, Chemical Technology Consultancy, 16 Bramley Grove, Crowthorne, Berks RG11 6EB
Mr J Khan, 10 Keysland, Thundersley, Benfleet, Essex SS7 3TW
Mr A J King, Tokheim Corporation, PO Box 360, Fort Wayne, Indiana 46801, USA
Mr K G Kinsella, AEA Technology, Thomson House, Riseley, Warrington, Cheshire WA3 6AT
Mr P Knoedel, BP Zambia Limited, Mutaba House, Cairo Road, Lusaka, Zambia
Mr M Kramer, Envo Services, PO Box 1629, Jeddah 21441, Saudi Arabia
Mr M Krishnathasan, PO Box 2809, Sharjah, United Arab Emirates
Mr I H Lavonius, 13 Leckford Road, Oxford OX2 6HY
Mr D J Lewis, Shell International Petroleum Co Ltd., Shell Centre, London SE1 7NA
Mr J M Lucas, Tesco Stores Ltd, PO Box 18, Delamare Road, Chestnut, Waltham Cross, Herts EN8 9SL
Mrs C MacGregor, Radian Ltd, Meirion House, Guildford Road, Woking, Surrey GU22 7QF
Mr A Y Mandourah, Lube Oil Re-Refining Company, PO Box 31717, Jeddah 21418, Saudi Arabia
Mr J E Mangosio, Faculty of Engineering, University of Buenos Aires, Paseo Colon 850, 1063 Buenos Aires, Argentina
Mr K L V Martin, 9 The Square, Ashfield, Dunblane, Perthshire FK15 0JN
Mr L S Mattinson, British Gas E & P Ltd, Rough FM & SB, Dimlington Road, Easington, Hull HU12 0SX
Mr J H May, 121 St James Lane, Coventry CV3 3FW
Mr R A McAvey, 819 Finchley Road, London NW11 8AJ
Mr D McGlynn, Doric Management Consultants, Bluegates, Willow Avenue, Oxford Road, Denham, Uxbridge, Middx UB9 4AF
Mr A J Mischel, 8 Monkville Avenue, London NW11 0AH
Mr G B Mitchell, The Castle Hotel, St Peters Square, Ruthin, Clwyd LL15 1AA
Mr C Morgan, VP - Engineering, Interline, 160 West Canyon Crest, Alpine, UT 84004, USA
Mr S Morrell, Morson International, 5655 Lindero Canyon Road, Suite 222, Westlake Village, CA 91362, USA
Mr A J Mortimer, Kilcombe, St Thomas's Well, Stirling, Falkirk FK7 9PR
Dr R J Morton, Commonwealth Development Corpn, One Besborough Gardens, London SW1V 2JQ
Dr K J Murphy, Environmental Resources Management, 106 Gloucester Place, London W1H 3DB
Mr L N Narrell, Business Alliances, Baker Hughes Inc, Shirley Avenue, Vale Road, Windsor, Berks SL4 5LF
Mr R J Newall, Robert Fleming & Company Limited, 25 Copthall Avenue, London EC2R 7DR
Mr P E Panther, QED Petroleum Limited, Unit 2, Suffolk Road, Great Yarmouth, Norfolk NR31 0LN
Dr M Patsoules, 20 AG. Anargiron Street, N. Halkidon, Athens 14343, Greece
Mr J K Purcell, Carrigeen, 12 Highfield Road, Rathgar, Dublin 6, Ireland
Mr N B Quinn, 9 Kirkstead Close, Oakwood, Derby DE21 2HN
Mr N Rahuman, Arabian Industries, PO Box 51, P C 124., Rusayl, Sultanate of Oman
Mr V Redko, Jurby Enterprises UK Ltd, 130 Jermyn Street, London SW1Y 4UJ
Dr W Reid, 40 High Street, Buckie, Moray, Aberdeen AB56 1AU
Miss H Richardson, 10 Forest Gate, Mopley, Southampton SO4 1GW
Mr J Richardson, 5 Geary Court, Geary Drive, Brentwood, Essex CM14 4XP
Mr A Rogers, 17 Sunset Avenue, Chingford, London E4 7LW
Mr S A Sawers, 11 Bucklerdurn Dirve, Peterculter, Aberdeen AB1 0XJ
Mr V Sharma, Premier Agencies K Ltd, PO Box 44432, Nairobi, Kenya
Mr M A Smallwood, 17 Charles Street, Berkhamsted, Herts HP4 3OG
Mr D J Smith, Tuboscope Vetco (UK) Ltd, Badentoy Av., Badentoy Park, Portlethen, Aberdeen AB1 4YB
Mr E J Snelling, 47 Ewell Park Way, Ewell, Epsom, Surrey KT17 2NW
Mr M Southall, 115 Bedells Avenue, Black Notley, Braintree, Essex CM7 8NA
Mr T M Stedman, 29 Reed Drive, Marchwood, Southampton SO4 4YF
Mr G R Stephens, International Training Service Ltd, 73-75 Mortimer Street, London W1N 8HX
Mr G D Tobin, Foster Wheeler Evergy Ltd, Foster Wheeler House, Station Road, Reading, Berks RG1 1LX
Mr D C Twinn, GATX Terminals Ltd, Askews Farm Road, London Road, Grays, Essex RM17 5YU
Mr M D Ullman, Sun Oil Britain Limited, Sun Oil House, 25 Union Terrace, Aberdeen AB1 1NN
Mr A Usmani, Baker Jardine, 19 Heathmans Road, Parsons Green, London SW6 4TJ
Mr A Winship, 28 Southdown Road, Wimbledon, London SW20 8PT
Mr K A Yasin, 41 Rectory Road, Stoke Newington, London N16 7PP
Mr S P Yeoman, Interline Resources, 160 W Canyon Crest, Alpine, UT 84004, USA

STUDENTS

Mr J O Afolayan, 10 Horton House, The Crescent, Cardiff Road, Cardiff CF5 2DL
Miss J S Goodland, 5 Lucastes Avenue, Haywards Heath, West Sussex RH16 1JE
Mr K Kapur, 50 Harley Street, London W1N 1AD
Mr E C Tan, Royal School of Mines, Prince Consort Road, London SW7 2AZ

PEOPLE

Ms Terry G Dallas takes over from Camron Cooper as Treasurer and Senior Vice President of ARCO International Oil and Gas Company. Dallas, previously Vice President of Planning, is succeeded by **Ms Linda G Harvard**. Meanwhile, at ARCO British Limited, **Mr Stephen G Suellentrop** has been appointed Managing Director. He was previously Vice President Engineering and Technology for ARCO's Operations Department in Plano.

Elf Oil UK has appointed Mr Alain Dujean Marketing Director. He will oversee Elf's UK retail network, lubricants, commercial and industrial products, bottled gas and other support functions.

The Statoil Group has announced the appointment of **Mr Marcel P Kramer** as Senior Vice President, Southeast Asia and Managing Director, Statoil (Thailand) Ltd. Based in Bangkok, Thailand, he will work closely with Statoil personnel in Singapore and Vietnam.

LASMO plc has appointed **Mr Richard L Smernoff** Finance Director. He was formerly Chief Financial Officer for Datascope Corp. of New Jersey, USA.

Mr Roland Fox replaces **Mr Jean-Michel Runacher** as Chief Executive of Kelt Energy plc. Mr Fox was previously president of Kelt US.

Mr Peter Duffy succeeds Nick Coleman as Managing Director of BP Energy Limited. Most recently, he was responsible for BP Oil UK's industrial and public sector fuels business. Mr Coleman will take up a new appointment in the BP group. He remains a non-executive director of BP Energy.

Mr Lucio Noto has been elected Chairman and Chief executive of Mobil Corp and Mobil Oil. He succeeds **Mr Allen Murray** who has retired. Mr Noto joined Mobil in 1962. He was appointed Chief Financial Officer of Mobil Corp in 1989 and elected President and Chief Operating Officer last year.

The Frost Group plc has appointed **Mr David Bartlett** Group Company Secretary and **Mr David Wright** Marketing Manager-Petrol Retailing Division. Mr Bartlett joins the Frost Group from Grant Thornton and Wright from Mobil Oil Co.

Mr John Waddell will head Kvaerner H&G's new Business Development Group as Vice President Strategy and Coordination.

Oceaneering International Inc. has appointed **Mr Fred Shumaker** Vice President Oceaneering Production Systems. His responsibilities will now include business development, project management and engineerng activities.

Mr Georgy Ponosov will manage Rotork Controls first Russian office, which is expected to be operational in April. He will be based in Moscow.

McDermott Engineering (Europe) Ltd has appointed **Mr Tony Green** to the new position of Manager of Technology.

Mr Mike Fleming, former Head of Scottish Enterprise's Energy Group, is now Director of Business Development and Deputy Chief Executive at Grampian Enterprise Ltd.

Mr Steve A Haidar has been promoted to Senior Vice President of Finance/ Administration and Business Development for Atlas Wireline Services, a division of Western Atlas. He will be based in Bahrain

Mr Chris Barfield is now Managing Director of Lucas Management Systems and Lucas Engineering Systems', new Systems Engineering and Software Division. **Mr Alan Carmichael** takes over as Director and General Manager of Lucas Management Systems and **Dr Peter Johnson** as Director and General Manager of Lucas Engineering Systems.

Mr David M Demshur has been elected President of Core Laboratories, a division of Western Atlas Inc. based in Houston. He succeeds Mr Joe Saltamachia, who retired in December.

Mr J Frank Travis has been appointed Executive Vice President of Ingersoll-Rand. His portfolio now includes European operations, worldwide operations of Ingersoll-Rand Construction and Mining, Air Compressor and Production Equipment groups as well as the Washington Sales Office and Ingersoll-Rand Canada.

Mentor Engineering Consultants has appointed **Mr Stephen Rogers** General Manager of their Aberdeen office.

Mr Bill Oliver, Technical Director of AMEC Process and Energy's Wallsend facilities, has been appointed visiting professor at the University of Newcastle upon Tyne. He will lecture on engineering design.

The co-sponsers of The National (Dangerous Substances) Driver Training Scheme have elected **Mr Peter Newport** to the position of Chairman. He replaces **Mr Barry Whittaker**. **Mr Roy Boneham** was also elected as Vice-Chairman.

Mr Gordon Raeburn has been appointed to the postion of Manager-Safety Projects for Offshore Design Ltd.

Mr David Watson, on secondment from BP, has been appointed as Chief Executive of the new DTI Oil and Gas Projects and Supplies Office. The head of the former Offshore Supplies Office, **Mr John D'Ancona**, will retire later this year.

IP THE INSTITUTE OF PETROLEUM

BACKGROUND COURSES

INTRODUCTION TO OIL INDUSTRY OPERATIONS

Wednesday 22 June – Friday 24 June 1994

This is designed as a general introduction to the whole range of oil industry operations from the search for oil and gas to the delivery of products to the customer. It will include an appreciation of the principal functions of the different parts of the petroleum industry and the inter-relationship between them.

It is likely to be appropriate for:-

- Participants from within oil companies whose experience is limited to one function of the industry and who require a broader perspective of the industry and its activities.
- Participants from financial and commercial institutions, other energy industries, analysts, suppliers, service companies and contractors; and government organisations who need an informed 'birds eye view' of the oil industry.

TOPICS TO BE COVERED DURING THE THREE DAYS WILL INCLUDE:

- ▲ *Changing Perspectives in the International Oil Industry*
- ▲ *Petrochemicals*
- ▲ *Basic Concepts of Drilling*
- ▲ *How Technology serves the business*
- ▲ *Petroleum Production*
- ▲ *Introduction to Retail Marketing and Distribution*
- ▲ *Supply*
- ▲ *Refining*

This is a self-contained course but is followed by:

INTRODUCTION TO PETROLEUM ECONOMICS

Monday 27 June – Wednesday 29 June 1994

This course is designed as a general introduction to the economics of the oil industry and may be particularly valuable to companies who do not hold their own in-house induction courses covering this subject.

It is likely to be appropriate for:

- Participants from within the oil industry whose experience is limited to one function of the industry and who require a broader perspective of the economic factors affecting the industry.
- Participants from financial institutions, government, other energy industries and the supply and service industries who require to obtain an informed and concise introduction to the economic and commercial background to the industry.

TOPICS TO BE COVERED DURING THE THREE DAYS WILL INCLUDE:

▲ ***Geopolitics of Oil***

OPEC/Middle East
Asia and Pacific Region
Eastern Europe and the Former Soviet Union
North America
North Sea Basin

▲ ***The Oil Markets***

Crude Oil Markets
Product Markets
Oil Price Information
Oil Futures Market
Oil Supply and Price – The Outlook

▲ ***Structure of the Oil Industry***

Development of Major Oil Companies
The National Oil Companies
The Role of the Independents

For copies of the registration forms for both courses
please contact Pauline Ashby, The Institute of Petroleum, 61 New Cavendish Street, London W1M 8AR.
☎ Tel: 071-636 1004. Fax: 071-255 1472

14th World Petroleum Congress

29th May - 1st June 1994, Stavanger, Norway

'PETROLEUM IN A WORLD OF SUSTAINABLE GROWTH – CHALLENGES AND OPPORTUNITIES'

The World Petroleum Congresses is an international organisation, founded in London in 1933 and supported by 40 of the world's major petroleum producing and consuming countries. Its main activity is the Congress, which takes place every three years and is regularly attended by participants from more than 70 countries. The Congress in Stavanger is the 14th in the series. The Congress covers all scientific and technical aspects of the industry, from exploration to downstream operations and includes all aspects of the natural gas and petrochemical industries, petroleum finance, economics, management and environmental matters.

Those attending the Congress include senior management and executives from petroleum companies, functional managers and their staffs, and scientists and technologists working in the industry. Other participants are academics and research workers from universities and institutes, government officials in energy and related ministries, and international civil servants. Independent energy advisers and consultants also attend, along with economic and finance specialists, service and equipment industry personnel, and representatives of trade and professional associations.

Plenary Speakers

▲ Mrs Gro Harlem Brundtland, *Prime Minister of Norway* ▲ Sir Peter Holmes, *Former Chairman, Royal Dutch/Shell Group*
▲ Constantine S Nicandros, *Chairman Conoco and Vice-Chairman Du Pont* ▲ Alexander E Putilov, *President, Rosneft.*
▲ Dr Subroto, *Secretary-General of OPEC* ▲ Serge Tchuruk, *Chairman, Total*
▲ Helmut Werner, *President, Mercedez-Benz* ▲ Masamoto Yashiro, *Executive Vice-President, Japan Citicorp/Citibank*

Technical Programme

The programme has been designed, by commissioning the leading global experts to report on the latest developments. 16 high level Forum sessions covering every aspect of the global oil and gas industry and 7 Review and Forecast Papers. 80 distinguished speakers and 50 poster presentations. National Committee and commercial exhibition.

Technical Visits

18 technical visits to 7 offshore platforms, concrete construction, platform fabrication. Statoil gas terminal, service stations etc. Pre and post-tours to Spitzbergen, Lofoten, Bergen, The North Cape, Hardanger etc.

Social Programme

Covering opening and closing ceremonies, concert, receptions, Norway Night and a programme for accompanying persons.

FOR FULL PROGRAMME, BROCHURE AND REGISTRATION FORM CONTACT:

WPC – 94 Secretariat
c/o Statoil, PO Box 300
4001 Stavanger, Norway
Tel: +47 51 80 60 81/6141/6045
Fax: +47 51 80 60 20

WPC Secretariat
61, New Cavendish Street
London, W1M 8AR
Tel: +4471 636 1004
Fax: +44 71 255 1472