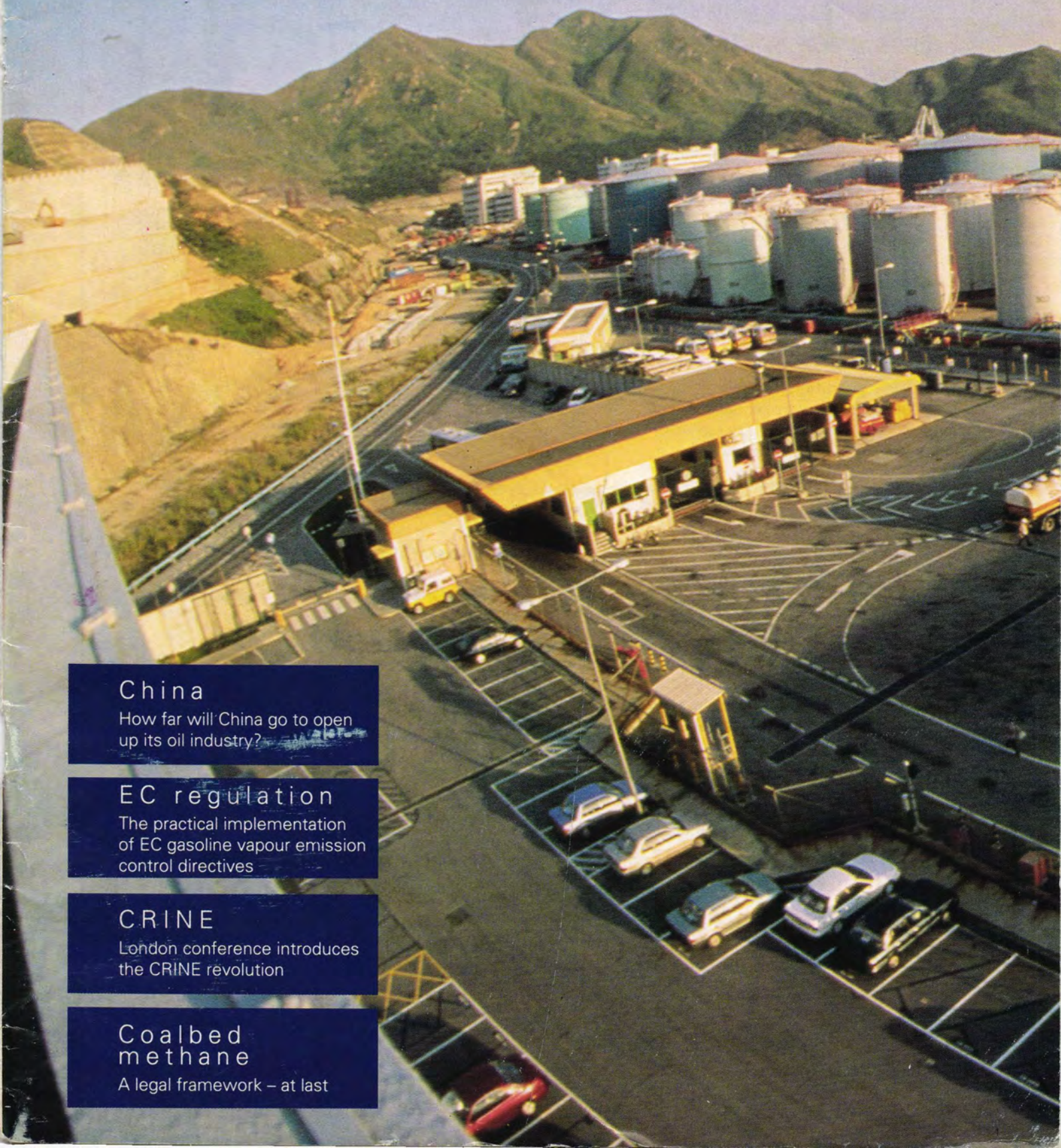
PETROLEUM REVIEW

IP THE INSTITUTE OF PETROLEUM

January 1994



China

How far will China go to open up its oil industry?

EC regulation

The practical implementation of EC gasoline vapour emission control directives

CRINE

London conference introduces the CRINE revolution

Coalbed methane

A legal framework – at last

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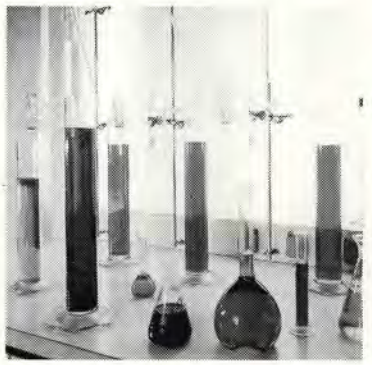

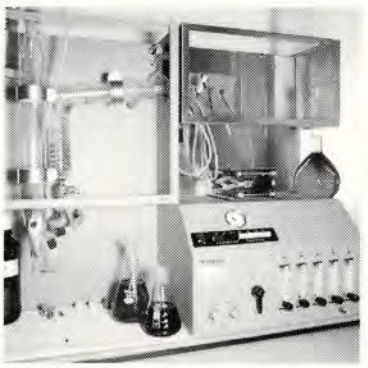

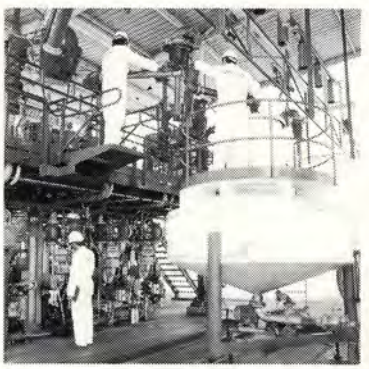

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MILAN CO-ORDINATION CENTRE
VIA GASPARE GOZZI 1/A
20129 MILANO ITALY
TEL: 02/7393310 FAX: 02/70124692

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EDITORIAL

Editor: Carol Reader
Deputy Editor: Susannah Cardy
Sub-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: Brian Broome
2 Luke Street, London EC2A 4NT
Telephone: (0732) 866360

PUBLISHERS

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INSTITUTE OF PETROLEUM
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Director General: Ian Ward
Membership Services Director: Roger Sparrow
61 New Cavendish Street, London W1M 8AR
Telephone: (071) 636 1004. Telex: 264380
Fax: (071) 255 1472

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CONTENTS

COVER PHOTO
Tsing Yi oil depot

NEWS IN BRIEF

24 November
French economy minister, Mr Edmond Alphandery, confirmed that Elf-Aquitaine will be the first major company to be sold off this year. He indicated that the government's 50.8 percent stake will be offered in stages in what will be 'a difficult privatisation'.

25 November
OPEC ministers meeting in Vienna failed to reach an agreement on output cuts.

AMEC has signed a joint operation agreement with Indonesia for the fabrication of large platform topsides for offshore oil and gas developments in ASEAN territorial waters.

New standards of competence for individual oil and gas workers are to be offered for accreditation in a joint agreement between City and Guilds and OPITO. It is hoped the move will establish a nationally-accepted benchmark against which individuals can be assessed.

26 November
Bell Gas has become the first independent to compete with British Gas in the interruptible gas market. In a landmark deal between the two firms, Bell now has the right to supply a number of industrial sites.

Ecuador's Congress has agreed to a legal change which would make foreign oil investment a more attractive proposition and break Petroecuador's monopoly in certain sectors. It is five years since the country last secured an exploration contract.

A deal to distribute petrol to remote areas of the Russian Federation has been signed by Marine & Mercantile Securities of Dublin. The company will use a 100-strong fleet of 40-ton tankers.

SABIC has set up a new affiliate in Milan, further strengthening its marketing capability in Europe.

29 November
Oil prices dipped below $14 a barrel for the first time in five years. Fears that Iraq may be allowed back into the international market by mid-1994, together with OPEC's decision to leave its output ceiling unchanged *(see above)* were blamed for the slide.

South Africa is planning to start a licensing round in the second half of 1994, according to ANC President, Nelson Mandela.

An explosion on the Norwegian LPG carrier, *Nyhammer,* left six dead and injured 10 others. The vessel was about to undergo repairs at South Korea's Hyundai Mipo dockyard. A previous explosion on the carrier in 1991 caused one death.

30 November
BP announced it is to extend its exploration activities in Colombia by acquiring Maxus Energy Corporation's interest in the Recetor block for $10 million. The new 53.33 percent stake will be added to BP's existing 10 percent interest.

The Hewett gas field in the southern North Sea was shut down in the early hours of the morning and 21 non-essential personnel evacuated after the discovery of a gas leak. Operator Phillips Petroleum said the incident was over by late morning.

Amoco has acquired Pennzoil (UK) from Pennzoil Exploration and Production Company for an undisclosed sum.

1 December
UN sanctions against Libya under Resolution 833 are now in force (see December issue, *Petroleum Review*).

British Gas has agreed a deal with Poland, which grants the firm oil and gas exploration rights over 9,000 sq kms of land, 100 kms west of Warsaw.

Chevron USA has agreed to pay $87.7 million to the state of Alaska to settle the long-running dispute over payment for state-owned oil.

ENI's petroleum distribution arm, AgipPetroli, has sold its Argentine operation to local group, Yacimientos Petroliferos Fiscales, for $70 million. The sale was made in order to concentrate on markets in Europe and south-east Asia and to raise revenue prior to ENI's privatisation.

2 December
BP's European oil refining and petrol retailing arm is to axe 2,500 jobs and cut costs by over £200 million over the next two years.

ENI has threatened to sue over allegations made by former chairman Alberto Grotti that managing director Franco Bernabe took bribes.

Consafe Engineering has won its bid to convert the Morecambe Flame jack-up rig into an accommodation unit for the Liverpool Bay integrated development. The £20 million contract, awarded by Hamilton Oil, looks set to create 250 new jobs on the Clyde.

The new joint venture between AOC International and Brown & Root has already won a £30 million, three-year contract from Elf Enterprise. The joint venture will provide integrated engineering and construction services for Elf's North Sea operations.

5 December
The Australian government has invited bids for petroleum exploration rights in 11 offshore areas. The closing date for applications is 6 May 1994.

6 December
Castrol has set up a new technology centre in Thailand, which will specialise in motorcycle lubricant research.

Bridge Oil announced it is acquiring assets in the western United States from Santa Fe Energy Resources for US$50 million. The deal will include properties in both the Anadarko Basin, Oklahoma, and in the Texas Panhandle.

The Onassis group has ordered a further 303,000 dwt VLCC from the Sumitomo shipyard. This will be the eighth vessel in its current tanker building programme.

British gas prices are average in the developed world, according to a new league table of 10 countries. The UK comes fifth, below Italy, Germany, France and Sweden.

Oil production in the CIS dropped 13 percent during the first 10 months of last year, according to the CIS Statistical Committee. Natural gas output fell by two percent during the same period.

7 December
Shell has abandoned exploratory drilling in the Barents Sea because of disappointing reservoir performance.

8 December
Russia is auctioning 18 percent of its shares in the country's largest oil refinery, Omskneftorgsintez. The Siberian refinery has a rated capacity of 560,000 barrels per day.

The Wytch Farm partners have been granted planning permission to construct a new well site on the Goathorn peninsula. The well, which is to be built over the next six months, will boost oil production by 10 percent during the year.

Israel has invited six international companies, including British Gas, to tender for contracts to build natural gas-fired electricity generation facilities and to transmit natural gas to the country. The move is based upon the assumption that supply contracts will soon be signed with Qatar and Egypt.

9 December
A group of UK service firms believe they have the technology to allow the exploitation of previously uneconomic subsea oilfields. The group, led by Lasalle Engineering, has launched a project to look at the use of ESPs in marginal and deepwater fields.

Two Japanese oil companies, Teikoku Oil and Japex, have won a contract to explore for oil off the coast of Zhejiang, in the East China Sea.

Foster Wheeler has completed the £70 million isomerisation unit at Mobil's Coryton refinery under budget and three months ahead of schedule.

12 December
A blowout at the Hua Bei oilfield in the north China province of Hebei has killed at least six people and injured nearly 600.

DATES FOR YOUR DIARY

IP THE INSTITUTE OF PETROLEUM

Thursday 13 January 1994
5.00 p.m. for 5.30 p.m. – 7.00 p.m.

'Western Investment and Tax in the Russian Oil Industry'

By Mr Brian A Lavers, CBE

A discussion based on Phibro Energy Production Inc's experience with its White Nights project in Western Siberia.

Organised by Energy for Economics Discussion Group

IP Contact: Pauline Ashby

Tuesday 25 January 1994
5.30 p.m. – 5.30 p.m.

'Air'

Dr Tom Crossett, Secretary General of the National Society for Clean Air and Environmental Protection, will present a paper which will address air quality and air quality monitoring; air quality standards and the actions necessary to maintain these standards.

Organised by Environment Discussion Group.

IP Contact: John Phipps.

Tuesday 15 February 1994
5.15 p.m. for 6.00 p.m.

'Petrol or Diesel – Which is Better for Air Quality?'

By P Gadd,
Shell International Petroleum Company Ltd

The presentation will consider firstly what is meant by air quality in both a local and a global context. The impact on air quality on the refining process and of vehicle emissions will then be discussed, examining the influences of vehicle technology, engine maintenance and fuel quality. Finally, some general conclusions on the relative merits of the fuels will be drawn.

London Branch Meeting

Contact Secretary Mrs E Walker – Tel: (0926) 404 257

Thursday 24 February 1994
5.00 p.m. for 5.30 p.m. – 7.00 p.m.

'The Oil Exchanges and the 24 Hour Trading Day'

By Daniel Carr,

New York Mercantile Exchange, London

Topics to be covered include transparent exchange futures prices; when the markets are liquid, and when they are not; development of screen-based oil futures trading; the demand for extended futures trading; and derivatives trading.

Organised by Energy for Economics Discussion Group

IP Contact: Pauline Ashby

FUTURE MEETING

Mr Hasegawa, General Manager of the London office of Tokyo Electric Power Company Inc., will be talking on matters relating to the energy profile, and the role of LNG in particular, in the Japanese context on:-

Tuesday 22 March 1994, 5.00 p.m. for 5.30 p.m. – 7.00 p.m. at The Institute of Petroleum .

For further details contact Pauline Ashby.

Organised by the Energy for Economics Discussion Group

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.

NEWSDESK

Concern over payment of Odeco safety fine

As *Petroleum Review* went to press, MPs and union leaders were deeply concerned that a £75,000 fine, imposed on an offshore company for a breach of health and safety regulations, might never be paid.

The fine arose from a case at Aberdeen Sheriff Court last November in which Odeco Drilling (UK) pleaded guilty to breaching Section 3(1) of the Health and Safety at Work Act after the death of a roustabout in 1990.

Mr James Tierney, defending, told Sheriff Alexander Jessop that Odeco had been acquired early in 1992 and had ceased to have any assets. This took place before there was any indication of a prosecution, he said.

That acquisition was made by Diamond-M Offshore, after which the company changed its name to Diamond M-Odeco Drilling (UK). Early in 1993, the company changed its name back to Odeco Drilling (UK).

Mr Ian Wilson of Diamond Offshore said that Odeco had not been part of the firm's organisational structure since early last year. 'They are two completely different companies,' he said, 'and we have no involvement with the historical information relating to Odeco'.

Asked by *Petroleum Review* whether the fine would be paid by Odeco, defence agent Mr Tierney declined to comment.

When imposing the fine on Odeco, Sheriff Jessop said it remained to be seen how successful the court would be in obtaining payment. A fortnight later, a court official told *Petroleum Review* that the deadline for payment had passed and a warning note would be issued.

On 23 September last year, Odeco did pay a £25,000 safety fine in full. This had been imposed by the same court for the company's part in the Ocean Odyssey rig disaster (see *Petroleum Review*, September 1993).

The case has angered union leaders and MPs alike. OILC union leader, Mr Ronnie McDonald, said it revealed a deep fundamental flaw in the whole issue of corporate responsibility.

As *Petroleum Review* went to press, Scottish National Party MP, Mr Alex Salmond, was preparing to question the President of the Board of Trade about the matter in the House of Commons.

There has also been criticism of Crown prosecutors for a three year delay in bringing the case to court. 'One of the purposes of a fine is to act as a deterrent,' said Mr McDonald. 'After three years, this loses its relevance.'

The case itself concerned the death of Mr Michael Kelly, 48, struck on the head by part of a lock bar assembly in November 1990. He had been working on the semi-submersible drilling rig, Ocean Victory.

In court, Fiscal depute Ray Craig said that Mr Kelly had suffered severe brain damage despite wearing a safety helmet. He died from his injuries two days later.

The court heard that the equipment involved had not been properly maintained and that 'appalling work' had been carried out on the lock bar.

Mr Tierney said the company 'deeply regretted' the death.

Ireland's Whitegate refinery to operate commercially

The Irish government has approved a £25 million investment programme for the Whitegate oil refinery, which will allow it to operate commercially from 1996 and make it more attractive to potential foreign partners.

The three-year plan paves the way for the termination of the universally unpopular Fuels Order, which compels oil companies operating in Ireland to take 35 percent of their supplies for the Irish market from Whitegate.

The oil companies have always complained that the off-take increases the price of fuel, although Irish National Petroleum (INPC) maintains that the effect is minimal, adding only one third of a penny per litre.

Set up when the refinery was nationalised in 1982, the scheme is now set for abolition in December 1996.

The new investment plan is designed to improve the value of product yields at Ireland's only oil refinery, as well as reduce operating costs, conserve energy, improve logistics and increase throughput.

An industry source confirmed that the Irish government is currently involved in talks with international companies interested in a joint venture.

Falkland Islands oil prospects 'very good indeed'

The possibility that the Falkland Islands is surrounded by a huge oil zone some 25 percent larger than the British sector of the North Sea, now looks very likely.

A seismic study carried out by the British Geological Survey suggests the existence of a 200,000 sq km basin of potential oil-bearing rock. This compares very favourably with the British North Sea, which has a 160,000 sq km basin.

'All the indications are that we have a significantly large basin with a wide variety of play types and both source and reservoir rock,' principal geologist Nigel Fannin told *Petroleum Review*.

Although confirmation will have to wait until exploratory drilling takes place, Mr Fannin acknowledged that 'the prospects now look very good indeed'.

He said geological structures identified within the basin are very similar to the Brent field and to other North Sea formations. The relatively shallow water, 500 metres or less, is also similar to that of the North Sea.

The Survey plans to make recommendations for licensing to the Falklands government by the Spring.

Obituary

David Harding OBE, BP's top man in South America, died on 8 December after a long-running battle against cancer. He was 57.

Mr Harding, who gave up work only a few weeks before his death, had been head of exploration in South America for the past two years. Based in Bogota, his responsibilities included Colombia, Venezuela and Mexico. Previously, he was in charge of exploration and production in Europe.

During his 35-year career, Mr Harding served the oil industry worldwide. An engineer by background, he joined the Iraq Petroleum Company in 1958 and subsequently went on to work in Canada, the United Arab Emirates, Qatar, Norway and China.

He was a fellow of the Institute of Petroleum.

BP satellite pictures for sale

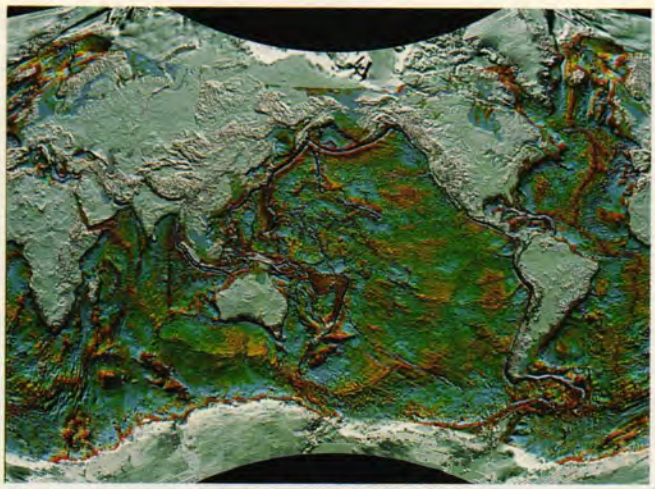
BP's extensive archive of up to 3,000 satellite pictures is now available on a commercial basis.

The images, which are expected to appeal to the smaller exploration companies, cover a large part of the world's oil exploration areas in Mongolia, the Middle East, the Arabian Gulf, Egypt, Vietnam and the Caspian Basin. Mosaics of regions include Northern Algeria and Saudi Arabia.

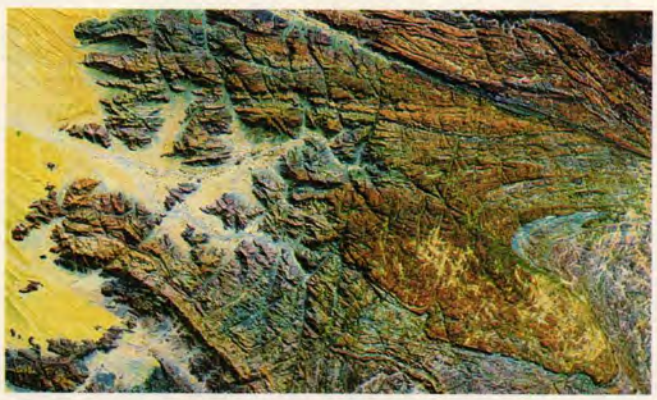
Most of the images were acquired by the US series of Landsat Earth resources satellites which are capable of detecting objects on the ground as small as 30 metres.

Sold in the form of photographic prints, the pictures will be available from the National Remote Sensing Centre, at Farnborough.

The appeal for the small and medium-sized companies, which do not have the funds to buy digital data on a regular basis, is likely to be the price. A typical Landsat Thematic Mapper (TM) image will cost around £500.



Gravity and topographic map of the world



Rock structures in Yemen

North Sea meets Safety Case deadline

The HSE deadline for submitting Safety Cases has been met without exception, with 215 received in all.

Although many Cases came in at the last minute (nearly 50 in the last four days), the Executive was always confident of a full response. 'No one had applied for an exemption and, technically, any company not complying by 30 November would have been in breach of the Offshore Installations (Safety Case) Regulations,' said a spokesman.

'Had there been evidence of deliberate withholding, the case would have been referred to the Procurator Fiscal.'

HSE now has the task of handling all the submissions, a process explained in a guide published just before the deadline.

The assessment will be in two stages. At the end of the first stage, which is due to finish this month, companies will be informed whether or not their Safety Cases are suitable for assessment. The second stage, in which HSE will interact with the operator over any improvements needed, will be carried out against a specified timetable for each individual Case.

'By September 1995, we would expect every duty-holder to know whether their Case has been accepted', said the HSE.

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 Executive.

Meanwhile, there are signs that UKOOA may be gaining ground in its bid to make proposals for new offshore fire and explosion regulations 'less prescriptive'.

Retired Health and Safety Commission Chairman, Sir John Cullen, told *Petroleum Review* that UKOOA's views must 'weigh fairly heavily' in the Commission's final judgement. However, a spokesman later said that a total of 60 responses had been received during the consultative process, all of which had to be considered.

The Commission hopes to have regulations in force by this summer.

Kazakhstan signs Western deal

The Republic of Kazakhstan has signed a major agreement with a consortium of Western oil companies to investigate one of the most prospective unexplored petroleum regions in the world.

Seven companies will explore the northern part of the Caspian Sea, which sits adjacent to Chevron's Tengiz field. This supergiant field has estimated oil-in-place of 25 billion barrels.

State oil company, Kazakhstancaspishelf (KCS) will act as operator, working in partnership with British Gas, Agip, Mobil, Shell, Total and an alliance between BP and Statoil. Estimates of the total cost of investment vary from $20 to $60 billion.

The long-term goal of the KCS is to transform itself into an independent oil company through the cooperation, support and training of these Western oil firms.

After an initial study programme lasting three to four years, long-term exploration and production contracts will be negotiated with the members of the consortium for parts of the sector.

At the signing of the agreement, President Nursultan Nazarbaev said: 'Kazakhstan has again demonstrated its commitment to the development of a strong market economy and a responsible approach to the most effective and rational use of its natural resources.'

Annex B consent

Energy Minister Tim Eggar has granted Annex B consent for Amoco's Baird gas field in the North Sea. This is the first field to benefit from new procedures introduced by the Department of Trade and Industry last month *(see page 14)*. Baird is estimated to hold 50bn cu ft of gas.

November Budget a welcome relief for industry

In contrast to the furore caused by March's 'bombshell' Budget, the UK Chancellor of the Exchequer's November proposals managed to avoid any more fundamental changes and have gained the broad support of the oil industry.

The most welcome change is in the tax treatment of pipelines – an anomaly introduced in the March budget and the only area that was ever likely to be up for reconsideration in the future (see *Petroleum Review*, August 1993).

November's proposal means that tariffs paid on oil and gas delivered from petroleum revenue tax (PRT)-exempt fields will not now be subject to PRT.

For Amoco, operator of the CATS pipeline, this means that PRT will not be levied on tariff receipts from new fields such as Armada and Britannia. The firm, which has long been lobbying for this change, said: 'The way is now open for CATS to compete for business on level terms with any future pipelines.'

The Chancellor also proposed that a company transferring field assets to an affiliate will be charged PRT on the disposal on the asset's market value.

This move closes a potential loophole by which companies could avoid PRT through the transfer of tariff-generating assets within companies. According to the Inland Revenue, the loophole could have resulted in 'significant future tax losses'.

The Budget closed another potential loophole by clarifying the rules over abortive exploration expenditure. The 1993 Finance Act made it possible for companies to claim relief for any abortive work carried out between 1960 and 1983. This 'oversight' could have cost the government £300 million. The new legislative change is retrospective to 16 March 1993 and will therefore cancel out any claims already made.

Other proposals in the Budget include a simpler rule for the future valuation of light gases and a 24-hour cut in the time allowed for making a nomination. This has been done in order to avoid abuse of the system by oil producers taking advantage of falling markets.

Fuel duties were raised by three pence a litre and the government also committed itself to annual increases of at least five percent a year until the year 2000.

The repercussions of the Chancellor's new three percent Insurance Premium Tax has yet to be seen. The likelihood is that certain marine insurance will not be affected, but it is not known whether this exclusion will include oil platforms or ships.

Ninian's 'unique' satellite development scheme

Chevron has reached a 'unique' agreement with its partners in the Ninian field which could soon produce an extra 100 million barrels of oil from a series of planned satellite developments.

Asset manager, Mr Syd Abbott, said the aim was to develop at least seven satellites as simply and as quickly as possible in order to maximise use of Ninian's facilities. The field is estimated to have a life expectancy of approximately 10 more years.

'We can't wait any longer,' he warned. 'It is important to realise Ninian has a finite life.'

The attractiveness of the satellites, which would be developed in the North East Flank (NEF) prospect and in blocks 3/2, 3/3 and Columba, is their low cost. The partners believe they can be developed within the current overall operating costs of Ninian – £95 million for 1993 and due to drop by another £10 million this year to £85 million.

The satellites will not only share the Ninian platforms' topside facilities for processing and metering, but production will also be routed to the Sullom Voe oil terminal via the Ninian pipeline system.

In addition, the commercial framework will allow the satellites to be drilled direct from the Ninian platforms using spare well slots. A total of 20 wells are planned by 1996.

Mr Abbott described the potential recoverable reserves of 100 million barrels – roughly equivalent to two-thirds of Ninian's remaining reserves – as a 'sizeable chunk'.

The framework, which follows just six months of discussion, has been heralded as a major breakthrough. Chevron had the difficult task of negotiating with nine different companies in widely-differing ownership percentages.

Ninian already has three existing satellites: Lyell, Staffa and Strathspey.

Go-ahead for Oman to India pipeline

India's Minister for External Affairs said he is sure plans for an underwater gas pipeline between Oman and India will go ahead.

Mr Bhatia said a feasibility study showed it was possible to link Oman and India by pipeline at a depth of 3,000 metres under the Arabian Sea.

Indian and Omani oil ministers signed a Memorandum of Understanding covering the pipeline, together with a plan to set up two oil refineries in India, back in March.

Sources say the proposed pipeline would stretch at least 1,200 kms and initially carry 50 million cubic metres of gas per day. Oman would bear the construction cost and work would begin in 1995, taking up to three years.

The Sultanate has 20 trillion cubic feet of proven natural gas reserves.

Oman will provide crude oil for the refineries, which would be located in Bombay and Madhya Pradesh. They will reportedly produce 120,000 barrels per day each, as well as gas for a joint venture fertiliser plant. The plant will have an annual capacity of 1.5 million tons of urea for marketing in India.

Transatlantic database for contaminated land

British firms involved in the treatment of land contamination are being offered the chance to market their technology in the United States via a new database.

The Vendor Information System for Innovative Treatment Technologies (VISITT) has been set up by the US Environmental Protection Agency (EPA) to provide information on the availability, performance and cost of different waste site treatments.

The EPA is now inviting UK firms to add their names to the database. Any interested parties should contact the Joint DTI/DoE Environmental Markets Unit (JEMU).

Mr Peter Jennings, a DTI export promoter specialising in both North America and environmental technologies, can also be contacted for information on overseas trade.

'Prospects for the upstream oil industry'

By Dr C S Gibson-Smith, Chief Executive, BP Exploration Europe

Dr Gibson-Smith gave the 1993 Institute of Petroleum Student Lecture at Heriot-Watt University in November. It was chosen as Heriot-Watt University's contribution to the Lothian European Lecture series, presented by the Lothian Regional Council. The theme of the lectures was 'Europe and the New World Order'.

He said in part:

Global scene – external forces

Contrary to an often widely-held belief, the oil industry is not immune to the economic factors which control other businesses and to the forces of change. To illustrate this reality there are two indicative and telling statistics:

- The fact that the world today consumes almost 20 percent more oil than in 1973, the year of the first 'oil shock'.

- That the price of our product is today lower in real terms than at any time since the autumn of 1973, and has been for several months. In fact the oil price has been on a downward trend for the last 15 years, a trend broken only temporarily by the Iraqi invasion of Kuwait. The levels we have seen recently represent a fall of 60 percent in the price of oil in real terms compared with 10 years ago.

To gain an insight into the causes of this extreme volatility, we need to understand the principal mechanisms driving the oil markets and the trends which can be drawn from the data.

From around 1979 to the mid 1980s, a hike in oil prices and an associated weakness in demand generated an increasing surplus in production capacity. Non-OPEC production, including a substantial contribution from the North Sea, was on the increase and the call on OPEC slipped to around 15 million barrels per day (mbd) as against a capacity of 30 mbd. OPEC was nevertheless defending high prices with a measure of success.

From 1986, market forces took over and oil prices crashed. Non-OPEC production flattened out and the call on OPEC increased steadily to around 22.8 mbd by 1990.

In 1990 the view was widely held that Iraq's invasion of Kuwait heralded the dawn of a new era in the Middle East, in which insensitivity to the needs of western oil consumers would generate substantially higher oil prices. In the event, no such change in policy has emerged. The loss of production from Kuwait and Iraq had remarkably little effect on oil prices, as increased Saudi production compensated in full measure.

Supply and demand balance

There is no indication from the evidence of more recent data that this position will change dramatically in the short term, whether by direct OPEC action on production quotas or through the effects of the supply/demand balance.

On the demand side, global oil consumption grew by just 0.5 percent in 1992 to reach 66 mbd, having been flat in 1991 and having grown by 1.1 percent in 1990.

This could be taken as evidence that oil demand is currently weak. In fact it disguises two critically important trends:

- The strength of oil demand in the world excluding the former Soviet Union and Eastern Europe – the non-OECD nations. Oil consumption in this area, comprising the OECD nations and the Lesser Developed Countries, grew by a healthy 3 percent in 1992;

- The weakness of oil consumption in non-OECD Europe. In 1992 this fell by 14.5 percent, almost 1.4 mbd.

The most rapidly expanding markets today are in East Asia. Consumption in South Korea, the Philippines, Thailand and China for example, showed growth rates of between 8 percent and 21 percent last year.

In 1992 the world outside the Former Soviet Union consumed 59 mbd, an increase of 8.5 mbd since 1985. That increase is equivalent to almost the entire output of Saudi Arabia.

In fact, the bulk has come from OPEC and from Saudi Arabia in particular. The capacity of Saudi Arabia to increase production, compensating initially for the loss of Kuwaiti and Iraqi output, has highlighted a production potential greater than many analysts had supposed.

The continued ability and willingness of OPEC, and the Middle East in partic-

ular, to dominate the market is evident in the worldwide distribution of reserves. The current reserve to production ratio for the USA is 9 years and for NW Europe just over 17 years. The figure for the Middle East is 100 years.

So the immediate picture for oil is one of relatively robust demand growth, a small but steady increase in non-OPEC supply and expanding supply from OPEC. A combination which probably points to a period of continued low prices – in the $15 to $20 ppb range.

Longer term forecasting

Longer term we encounter more uncertainty – and the pitfalls of forecasting are increased. Key uncertainties include the possibility of a further tightening of environmental policies and a consequent downward pressure on demand. Balancing this, however, is the possibility of increased demand as a response to weak oil prices.

Or we can change:

- Recovery rates from mature fields
- The rate of development of new large fields
- Government policies on access and fiscal terms
- Competition for investment funding

and

- The success rates for ongoing exploration activity

Clearly, all of these factors contribute to the uncertainty.

So we can say that it is prudent to base planning assumptions in a world of considerable uncertainty on continuing low oil prices, in the $15 to $20 range, and that OPEC will continue to have the ability to meet any increase in demand or shortfall in supply.

Consequences of low oil price

The global oil industry is experiencing the level and pace of industrial change of a new industrial revolution. The challenges facing the industry and the test of our ability to cope with change, are graphically illustrated by the scale of adjustment we have made in response to low oil prices.

I believe that in meeting this challenge, the industry has demonstrated an outstanding capacity to adjust and adapt to the reality of the markets. But we have achieved far more than merely adjustment. Before I expand on this theme, let me outline the scale of the challenge.

A sustained period of low oil prices has had a dramatic effect on profitability and cash flow for everyone in the industry – the public and private sectors, OPEC and non-OPEC producers and consumers.

For the private sector, this has meant that investment opportunities have been reduced and competition for investment funds has intensified.

Revenue for the oil majors from exploration and production activities has fallen by almost 40 percent in real terms over the past 10 years even though production has increased by 20 percent during the same period.

The resulting shake-out in the industry has been no less dramatic. Almost all of the international oil majors have made large cuts in their workforces during the past five years. These range from 20 percent in some cases to over 40 percent in others.

Exploration spend has also been reduced in each of the last three years by all of the major oil companies. In the US this is at its lowest level since 1976.

OPEC has also suffered. Latest estimates show that revenue for the 12 member states for the first half of last year was 30 percent below the level of 10 years ago. Given these constraints on the upstream industry during the low oil price era, it is not surprising that our ability to cope with the challenge has been questioned.

The remarkable fact, however, is that the industry has adjusted to live with these constraints, to a world of $18 oil and less. Just as we coped with the earlier dramatic fluctuations in price during the 1970s.

Healthy levels of global output have been maintained and should increase slightly over the next five years. The latest forecast of upstream activity and expenditure produced by Scottish Enterprise shows an increase from £108 billion in 1991 to £113 billion in 1997 for worldwide oil and gas expenditure.

The picture for the UK sector is remarkably similar, while reflecting some of the aspects of a mature province – a fall-off in exploration and appraisal spend, and a reduction in development expenditure.

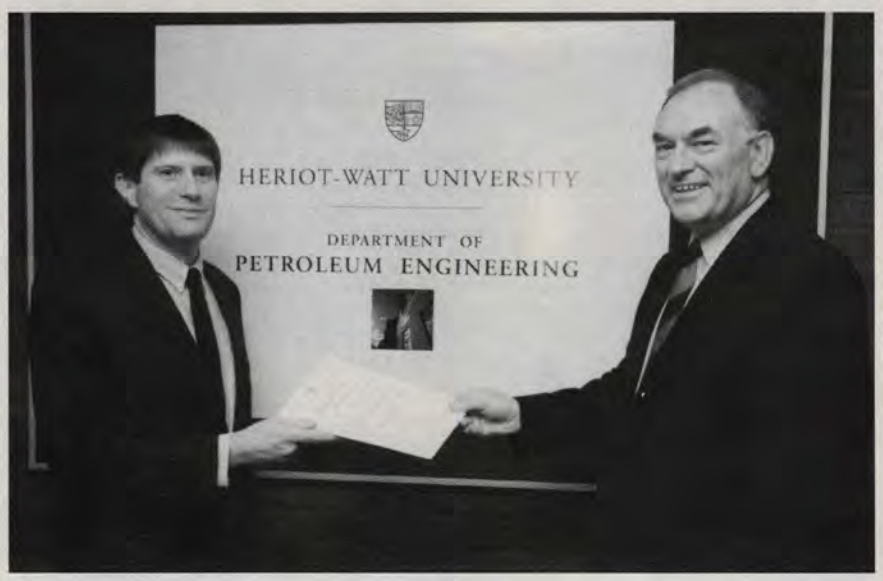
Production from the UK is currently expected to peak in 1995 at around 2.5 mbd.

By any measure, we are describing a dynamic industry with a robust future.

How to explain this remarkable achievement, and even more importantly, is it sustainable?

Industry response

I have already described actions the industry took in response to low oil prices and reduced cash flows. To cope with these constraints the industry has reduced capital and operating expenditure, driven down overhead costs and has put in place flatter and more flexible organisational structures and in many cases reversing the diversification trends of the 1980s.



Mr Ian Ward (right), Director General of The Institute of Petroleum congratulates Mr Mark Jackson (left), winner of this year's IP award as the student with best overall performance in the postgraduate Master of Engineering course in Petroleum Engineering at Heriot-Watt University, Edinburgh.

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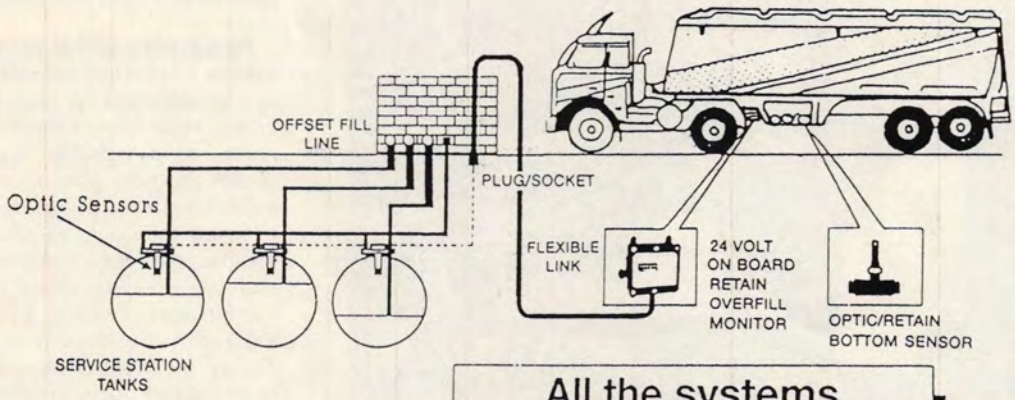

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Mr Ian Ward (left), Director General of The Institute of Petroleum and Dr Chris Gibson-Smith (right), Chief Executive, BP Exploration Europe, with Heriot-Watt University students Ms Tanya Berthoud from Carnoustie and Mr Paul Atkinson from Gateshead, joint winners of the Edinburgh and South East Scotland Branch of The Institute of Petroleum Prize for outstanding coursework in the second year of their Chemical Engineering degree course. The prize was presented prior to Dr Gibson-Smith's IP Student Lecture.

Profitability and productivity

Improved profitability is not just a matter of cutting costs or staff numbers, although that is regrettably one part of the process. It means ensuring that we get the best out of our investments – in people and in technology – by stripping away unnecessary bureaucracy, simplifying procedures and structures and using technical advances to meet commercial challenges.

The application of technology is opening up new frontiers for the industry. For example, the opening up of deep water provinces, many of which are proven sources of reserves. Twenty years ago, the industry's limit was 200 metres. Today we can explore for, and produce from, fields in water depths of 1,000 metres and more.

That opens up areas such as the deep water Gulf of Mexico, the Niger Delta, offshore Brazil, the Turkish Black Sea, the Norwegian Voring Basin and the UK Atlantic margin.

Technology is also making it possible for us to develop UKCS fields of less than 50 million barrels economically and to maximise production from the more mature fields in production:

- By allowing us to increase year by year the distance of sub-sea satellite tie-backs. Up to 50 kilometres is now achievable.
- By transporting multi-phase flow over 15 kilometres
- By extending the reach of horizontal drilling to 6 kilometres
- By reducing the need for costly new platforms and providing the possibility of unmanned structures
- By increasing well productivity through improved reservoir management and production techniques
- By reducing exploration costs as the use of 3D seismic permits the planning of more precise drilling programmes

These advances have made a significant impact on both costs and output.

Unit development costs in the North Sea have fallen by around 25 percent since 1986 and there is a prospect of further falls in the next generation of projects.

Redefining competition and cooperation

The impact of technology is significant, but it is not capable in itself of delivering the massive adjustment to low oil prices needed by the industry.

For this we have to look elsewhere and reassess the basic structure of our own organisations and of the whole industry at a global level. A structure in which the principal players – private companies, producing nations, state oil companies, host governments, the contract and supply sector – have previously been brought together only by convenience while pursuing separate policies based on self-interest.

When oil prices are $16 there is little room for the pursuit of narrow self-interest – partnership and cooperation are vital. Successful companies are redefining the boundaries of competition and cooperation. Both phases are becoming more intense but the increase in cooperation with both formal and informal partnerships has been radical.

Partnerships within organisations – where teamwork is not constrained by bureaucracy, rigid hierarchies and unnecessary overheads. Teams in BP are now setting and achieving their own targets choosing their own members. That has only been made possible by breaking down the barriers and divisions which existed in the recent past. Today we have a simpler, team-based organisation, totally focused on creating and delivering value from our asset base. And these teams are made up of lawyers, explorers, planners, reservoir and petroleum engineers, facilities and well engineers, operations and asset managers.

Partnerships between operators – to share risks, resources and improve the prospects and the economics of exploration and development activity. Our strategic alliance with the Norwegian state oil company Statoil has created a powerful and competitive profile for both companies on the international stage.

Partnerships between companies and their contractors – to ensure a common incentive for identifying the most cost effective ways of operating. A relationship in which the companies share the benefits of successful cooperation, in which both parties understand the needs of the other.

The traditional way of doing things created tension and a conflict of interest. The contractor was paid according to the number of man-hours used. The oil company's goal was to minimise the number of hours.

Now, common goals and relationships based on trust and the stability of longer term contracts are transforming the competitiveness and productivity of both parties.

Partnership with host governments – based on mutual interest. Such relationships must be founded on the right blend of opportunity and reward for investment. The industry can no longer continue investing large sums of money in exploration activity in prospects which offer at best only marginal returns. Mutual interest and need have always been there but often hidden by mistrust and confrontation.

Today, as we adjust to the dramatic political and social changes in the world, to the removal of barriers and divisions, we have an opportunity to work together in redefining the shape of our industry. Alignment of interest has played a vital part in our Colombian operations. In partnership with the state oil company Ecopetrol and with local and national government support, we have recently declared commercial the most important American oil discovery for 20 years. The two fields which we operate, Cusiana and Cupiagua, have minimum reserves of 1.5 billion barrels of oil and 3.2 billion cubic feet of gas.

The North Sea achievement

Consider for a moment this picture of the North Sea:

A mature province where all of the large fields have been found and are in the final years of economic production.
Where new discoveries are so small that no new developments are planned and exploration activity is reduced to an absolute minimum.
Where rising operating costs have forced installations and pipeline systems to be mothballed or abandoned.
Where government revenue is reduced to a trickle and job losses by the thousand are routinely expected and announced.
Where production no longer satisfies UK requirements and the country becomes once again a net importer of oil.
Where increasingly tight safety and environmental regulations have obliged companies to stop production from older installations because funding to reinvest in new infrastructure and training has gone to other oil provinces.
And where private funding for academic research and the development of new technologies is transferred overseas to areas of higher critical mass.

This depressing picture might have been reality today. Thankfully, it is a path which the industry chose not to follow. Not because the environment and the conditions I have described did not exist, but because we believed in a future for the North Sea and we have created that future. We did not like the script so we re-wrote it.

Let me give you two examples to illustrate how all this has been achieved.

BP is currently developing the Forth Field in the central North Sea using a hybrid platform – a concrete base with substantial storage capacity and a steel superstructure. Using horizontal drilling, we have halved the number of wells originally planned from 16 to 8. In 1990 the plans for Forth showed a negative value. Now the return is very attractive.

Technology has played a part and so has the new approach to teamwork. We have integrated all of the necessary skills into a single project team, including the contractors and the service companies. We have worked with them to define clear accountabilites and to share risk and reward so that each party has a fundamental stake in achieving success if they wish it. It is the sort of partnership we wish to create on every project and with every partner who chooses to do business with us.

The benefits of this approach are even more evident in BP's latest North Sea development, the Andrew Field. Andrew is a discovery which we made almost 20 years ago. It is a small field with recoverable reserves of just over 100 million barrels of oil and around 150 billion cubic feet of gas. Despite many attempts at finding an economic way of developing the field since its discovery, we were unable to move it forward. Today, we have a commercially attractive project which we expect to see in production in 1996, just at a time when prices may well be at historic lows.

The integrated approach to the project phase and the early selection of contractors has enabled us to have firm development costs before sanction. We have already trimmed £100 million from the capital costs and expect to identify further savings. As with the Forth development, we are confident that we will be able to reduce the number of development wells – in this case from 19 to nine.

North Sea future

Developing fields like Andrew and many which are very much smaller, is one of the keys to extending the life of the North Sea well into the next century.

There should be little debate about the potential. In addition to the 144 fields in production in the UK sector, there have been some 500 further discovery wells, accounting for more than 15 billion barrels of oil and equivalent gas and liquids.

The government estimates of what is yet to be found in the UK sector are – between 4 and 25 billion barrels of oil and up to 45 trillion cubic feet of gas.

But even before we consider this prize, there are major rewards for companies willing to reinvest in fields already in production. Twenty years ago maximum expected oil recovery rates from North Sea reservoirs were typically around the 30 percent mark. Today, the industry standard is about 45 percent – a 50 percent increase and surely that is not the limit of our ingenuity and our ability to continue developing and pushing back the limits of technology.

The recent measures taken by the government, in recognising the need to change the oil and gas taxation regime, are also playing an important part in providing an appropriate framework of reward and incentive for future investment and reinvestment in the North Sea. The emphasis of the taxation system has moved from subsidising exploration towards ensuring a more efficient development of the North Sea resource. Cash flows from the large mature fields have improved and this will assist the funding for the next generation of smaller fields. The incentive to cut costs and operate efficiently has also been increased. Under the new lower tax rate, companies retain at least 30 pence of every pound saved by cost reduction and productivity improvement measures, rather than 17 pence as was the case under the old regime.

BP is preparing to increase investment in the North Sea over the next three years. In part that is as a result of the extra cash flow from the reduction in PRT, but it has also meant that some development prospects are now much more commercially attractive. Our initial estimate of the effects of the increased investment is that we can look forward to raising total BP production in the UK by a further 6 percent in 1995.

That is good news not just for BP but for the whole industry, including contractors and suppliers, and of course for the nation, as more activity will mean a higher level of income. It is also good news for our home base in Scotland, where the initial and most direct effects of any increase in activity will be felt.

And the benefits do not end with the upstream sector. BP has invested over £1 billion in Scotland over the last three years on a series of projects linked to the expansion of our Forties Pipeline System and the refining and petrochemical facilities at Grangemouth. This investment stemmed from the realisation that production from Forties could be extended into the next century and the fact that the system would be transporting production from 18 fields in the central North Sea by the mid 1990's. In fact by the early part of next year, the system will be transporting up to 1 million barrels of oil per day, a significant proportion of total UK production.

Five years ago, the language we used to describe the future of the North Sea was rooted in pessimism. We spoke of terminal decline, of damage limitation, of decay and defeat. Today, the language of rebirth, of resurgence and renewal and of success holds sway. The transformation is a tribute to all of the actors involved on the North Sea stage – operators, suppliers, contractors and government.

The why and wherefore of CRINE

By Carol Reader

> ***'There is nothing more difficult to take in hand , more perilous to conduct, or more uncertain in its success, than to take the lead in the introduction of a new order to things, because the innovator has for enemies all those who have done well under the old conditions and lukewarm defenders in those who may do well under the new.'***
>
> **Macchiavelli**

These words of wisdom from the great Italian philosopher and statesman have been quoted frequently by those involved in the CRINE initiative. Somehow the message from the 16th century, directed at those governing a Renaissance state, seems particularly relevant to the new thinking emerging in the UK North Sea oil industry.

'Cost Reduction in the New Era' reduces to the acronym CRINE – which is apparently pronounced to rhyme with 'brine' rather than 'grin'. Far from a mere string of initials, it represents a fast-growing movement that wants to achieve a complete change, even perhaps a revolution, in the operations of the oil and gas industries in the North Sea.

The movement for change launched its current recommendations on 2 and 3 December at a conference held in London under the auspices of UKOOA and the DTI and organised by the Institute of Petroleum. So great was the interest that the conference was a total sell-out and would-be participants were turned away.

The CRINE message came across loud and clear and was seemingly unanimously supported. After two days 350 industry leaders, briefed and inspired, left London to spread the word, as though they were 20th century disciples.

In the words of Energy Minister Tim Eggar, who addressed the first afternoon session of the conference, 'Cost reduction is the most important challenge to the future of the oil and gas industry on the UK Continental Shelf'. He emphasized that costs in other parts of the world, such the Gulf of Mexico, were lower than in the North Sea with the result that unless the UK industry managed to become more efficient, the whole province would lose out. He promised DTI support to CRINE in its search for ways to improve the operating environment for industry. The minister added, 'The DTI will be a full partner in pursuing the changes needed.'

North Sea cross-roads

The CRINE initiative was set up by all the North Sea operators as their response to the critical challenges currently facing them. These include the maturity of many fields, ever lower oil prices, escalating capital and operating costs, as well as ever-increasing complexity and duplication of regulation and overwhelming bureaucracy. In his keynote address to the conference, Dr C Gibson Smith, Chief Executive Europe, BP Exploration, outlined these problems, referring also to the drop in revenue from exploration and production for the oil majors in recent years and the resulting global workforce cuts.

As Rex Gaisford, Director, Projects, Amerada Hess Ltd and Chairman, CRINE Coordinating Committee, said at an IP conference nearly a year ago, 'We are at a cross-roads in the history of the North Sea, at the beginning of a new era that requires new vision.'

CRINE is not just another set of initials nor an empty shell, it has a formal structure, sponsored and supported initially by UKOOA and later by many others. A steering group guided and coordinated the work of several workgroups which reported individually to the conference on their achievements and proposals in various spheres.

Although originally an operators' initiative, CRINE subsequently became industry-wide, drawing into its working groups top-level representatives of all sectors of the industry – contractors and suppliers, vendors and manufacturers, engineers, certifying authorities and government.

The future success of the movement for change, well and truly launched at the December conference, is now dependent on the proselytising efforts of those already involved. The question is whether the movement is going to be taken up by all sectors of the industry, at what level and by how many people.

CRINE – a practical handbook

The workgroups have come up with recommendations and views on the way forward elaborated in a 250-page report (yet to be published) and summarised in a shorter publication (now available). For its part, the DTI, acknowledging the same pattern of falling revenues and rising costs, produced its own study in February last year, entitled, 'Report of the Working Group on UKCS Competitiveness.'

The CRINE report's major recommendations are:

- Use standard equipment
- Use functional specifications
- Use criticality to determine documentation requirements
- Simplify/clarify contract language and eliminate adversarial clauses
- Rationalise regulations on certification, Production Consent, Pipeline Works Authorisations and Field Development Programmes
- Raise credibility of quality qualifications, such as BS 5750
- Bring in cultural change and education

It states that the adoption and implementation of all the CRINE recommendations would transform the industry, bringing a reduction in capital costs of at least 30 percent within two to three years. Other benefits would be lower operating costs, simplified maintenance and a safer working environment, which could, it is estimated, bring a further 30 percent saving in future years.

While these objectives are set out as targets to be achieved in the future, it is acknowledged that some companies have already moved in the CRINE direction (and have already shown the cost benefits).

The UKOOA member companies all agreed the contents of this report, while recognising that implementation of it remains the prerogative of individual companies.

Cultural change

The most sensational change in what is called 'culture' has already started during the first 18 months since CRINE came into being. Gone is the secrecy, the overwhelming competitiveness, the company isolation and individuality. In its place has come a willingness to be open, to share information, to work together to achieve the common good – the reduction in costs which will ensure their future profitability, some would even say their very survival.

This working group, chaired by M Curtis, General Manager Development, BP Exploration, envisages a culture 'characterised by teamwork and openness'. It aims at a Utopia where the full potential of people working together towards common objectives can be realized and all parties have the opportunity to prosper. It wishes to get rid of today's adversarial relationships and in their place build a new culture based on trust.

The group realizes that, in order to develop this culture, the whole industry has to turn on its head, acknowledging the evident problems of today's industry and then deciding it does want to change. Hopefully the facts and figures set out in the CRINE report will promote the changed thinking.

It is recognised that the present stage is only an intermediate one and that the cross-industry dialogue already emerging should continue and that every means available, from publications, speeches, conferences, to training programmes, should be brought into force to spread the message.

The CRINE report and the December conference were only the initial stage in this communication process.

Quality

The report bases its recommendations on the overall premise that the successful development of an offshore field is dependent on the quality of materials, design, manufacturing, engineering and construction. It believes that improved quality would make possible greater standardisation. In particular, the group criticised the BS 5750/ISO 9000 certification system. Many who crossed its path thought it guaranteed product quality – which was never intended. Moreover, there was concern that assessors with insufficient industry experience and technical knowledge were used. As a result, 'operators now have little confidence that the BS 5750 qualification effectively contributes to the value of the product.'

Technical standardisation

Again, simplification and rationalisation are stressed, with the aim of setting fit-for-purpose standards and specifications.

Priority should be given to standardising functional specifications for equipment for power generation, gas compression, cranes, high pressure pumps and firewater pumps. Other equipment should also be provided with similar standardised functional specifications but is given less priority and will be looked at during at the second phase.

The workgroup found 'a very strong support' from operators, contractors and suppliers for the development of simple, fit-for-purpose standards and specifications.

Certification and documentation

In the view of the relevant CRINE workgroup, the current complex style and management of documents are neither a legal nor a certification requirement. Everyone involved agreed that there was 'immediate scope' for a substantial reduction in the need for mountains of paper leading to a worthwhile cost reduction in this area.

Energy Minister Tim Eggar in conversation with Ian Ward, IP Director General, at the CRINE conference.

Mr Ward told Petroleum Review that the Institute of Petroleum was totally committed to supporting the CRINE initiative. Because of its position as an independent organisation representing all facets of the industry, upstream and downstream, operators and contractors, suppliers and manufacturers, the Institute was, in his view, in a unique position to help the CRINE process.

He said, 'Following the CRINE initiative, there will be a need to develop new codes and standards for the industry which is something the IP has been doing for the last 80 years. So we believe we have a significant role to play.'

The Institute was given the task of organising the December conference and many delegates had told him that the IP had done an 'excellent' job. He believed that if the CRINE initiative was going to succeed, then future conferences, workshops and seminars were going to be essential to maintain the momentum evident at the conference. 'The Institute is ideally placed to help to organise this process...provided that we are supplied with the appropriate resources to carry out the task.'

The CRINE conference at the Queen Elizabeth II Conference Centre, Westminster

RS Abma, Shell Expro, and Chairman of the CRINE regulatory workgroup, showed a slide of the pile of documents for a single project from feasibility to commissioning which generated over 100,000 documents reaching 1.5 metres from the ground (the product of 800 trees). Surely, with the application of other CRINE recommendations and specific efforts to cut paper work, he said, this could be substantially reduced. Again, the message was simplify...standardise... and self-regulate.

In this context, the working group members pointed out that a common electronic data interchange system would permit the cheaper and faster transfer of information.

Commercial relationships (contractual)

Working towards the overall aim of more harmonious relationships, the main objective here is to remove the adversarial climate and the consequent mistrust.

The industry has already moved towards simplifying and standardising contractual terms and conditions for fabrication and major offshore labour contracts. The report favours new-style contracts such as alliancing, partnering and risk/reward relationships where contractors share risks and rewards with their clients. Specific recommendations are made, for instance the elimination of liquidated damage clauses, and the use of a single quantity surveyor for valuations in place of the customary two.

Role of government

With the overall aim of streamlining legislation and regulation, CRINE welcomed the 1 December announcement of major simplifications to Annex B procedures (see box). These changes will save the companies thousands of pounds and reduce the burden of regulation. Dr C S Gibson Smith, Chief Executive Europe, BP Expro, in his speech to the conference, described the Annex B changes as 'a major step forward and an unprecedented indication of government support'.

CRINE's other concerns here refer to Pipeline Works Authorisations and Production Consents, hoping again to move in the direction of simplification and rationalisation.

Mandate for change?

With no voice of dissent publicly expressed at the December conference, the advocates of CRINE feel that they have backing from a wide range of senior representatives from the UK industry. While many companies and organisations will be involved in communicating the message, the initial instigators realize that a major publicity/education campaign is now required. If each person leaving the conference, spread the word to 10 more people in his own company and these 10 persuaded another 10 to take up the theme...

Summing up at the end of the conference, RJ Criswell, Managing Director, Amoco (UK) Exploration Co., said , 'This conference will be seen as the watershed in the UK oil industry... Either this industry becomes more competitive – or it dies prematurely. Only the fit can survive. Only the superfit can make the profits our shareholders want.'

While acknowledging that change is well under way in some sectors, Mr Criswell stressed that 'CRINE presents us with a great opportunity to change fundamentally the way we do things'.

'Ask not what your industry can do for you but what you can do for your industry...'

Changes to DTI regulatory procedures

The Department of Trade and Industry announced changes to its procedures for regulating oil and gas field development. Announced on 1 December, they took effect from the same day. The simplified regime will cut out a lot of detail and save the UK oil and gas industries considerable sums of money – perhaps £200,000-300,000 for every Annex B application.

The main changes concern amendments to the Annex B stage and the introduction of new Development Plans. The traditional highly detailed approach to Annex B is replaced with a less formal process, which focuses on identification and the resolution of any issues between the department and the licensees. The aim is to do away with excessive doumentation.

Small fields, defined as fields with less than 20 million barrels of oil or 60 billion cubic feet of gas in place, will be treated specially and not subject to the same rigorous assessment.

Approval times will be halved. Production consents will be more flexible and for longer periods, some even for the life of the field.

In more complex cases field consents will be for five to 10 years.

Reporting requirements during production will be much reduced.

New Development Programmes, in place of the former Annex B stage, will be slim summaries of licensees' plans and field management proposals. It hopes to make substantial reductions in the amount of paperwork previously required for Annex B documentation.

Energy Minister Tim Eggar said that production consents would be longer and more flexible. He added, 'In the past, when a field failed to perform to expectation, a revised Annex B had to be prepared. This was costly in both time and effort. Under the new process this will be much less common, because the Development Plan will set out a management strategy to cater for departures from expectation and the annual Field Reports will quickly identify divergences from the original plan'.

Hydrotreating – second time around

By Jonathan Taylor, Manager, Process Engineering and Christy Edward, Project Director, AMEC Engineering International

In Europe, the setting and enforcement of legislation to reduce acid gas emissions from the burning of diesel transport fuels has lagged behind the United States and Sweden. All this is likely to change however, following an announcement made by the European Commission last year, that from October 1996, diesel fuel burned in motor fuels shall have a maximum sulphur content of 0.05 percent wt.

Throughout the 1980s, UK refiners have been able to choose the relatively sweet crudes from the North Sea amongst their feedstocks. This has essentially allowed current sulphur specifications in diesel fuel (0.2 percent wt) to be met through use of the same refinery processing units as were originally designed to process the sourer Middle East crudes. From 1996 however, it is unlikely that selection of a suitable crude oil feedstock will be sufficient to meet the new sulphur specification for diesel.

The advent of this new EC legislation has resulted in contracts for the first grass-roots distillate hydrotreater units seen in the United Kingdom for 20 years, and also some significant revamps of existing units.

Hydrotreater technology has not stood still in the past 20 years. Catalyst manufacturers have developed a new generation of highly active cobalt-molybdenum catalysts which achieve the conversion of sulphur to hydrogen sulphide at lower operating conditions, for longer periods between 'decokes', and with reduced reactor volume. Past hikes in oil prices have enhanced the operator's and designer's awareness of the requirement for energy efficiency in their designs. Computer simulation tools have improved to the stage where a complete and accurate process model of the plant can be built and run with scores of processing options within the course of a week.

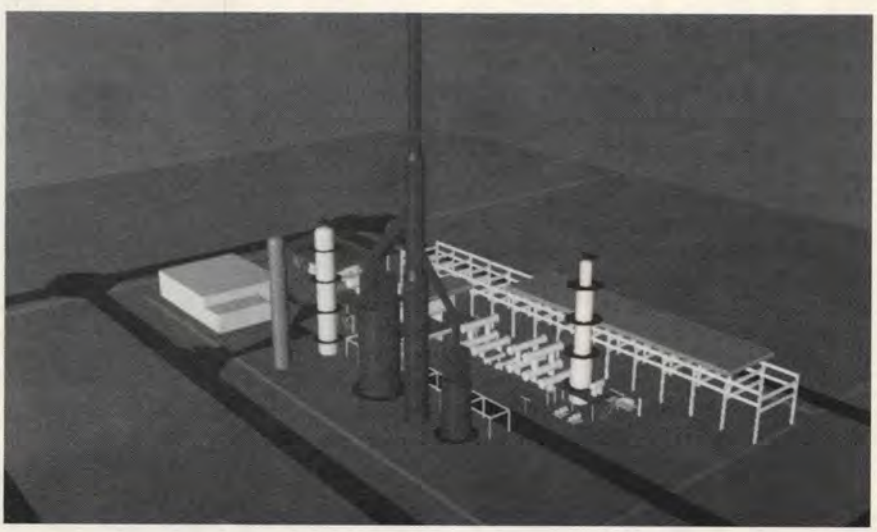
This 'second time around', the diesel hydrotreater also has to be designed to cope with the secondary feedstocks from the refinery conversion units. The straight-run material from the crude units is now supplemented by olefinic or cyclic material from the thermal or catalytic cracking units which, probably, have been installed in the refinery since the original hydrotreater was built. The additional compounds contained in cracked material require the process engineer to incorporate wide flexibility in his design to cope with both variations in hydrogen consumption and the hydraulics of alternative operations.

There will be further changes in product quality requirements in the future. The environmental consideration of sulphur content is not the only specification in refinery strategic development plans. The motor fuel qualities of cetane number and properties of the cold fuel will be important in the next decade. The prudent operator will request additional design flexibility to cope with these future requirements, and will work with the contractor to ensure that they can be met with the minimum of future revamp work. This may mean pre-investment in equipment with the capability for increased operating conditions, spare capacity or plot space to improve hydrogen supply and gas product handling.

In the past 10 years, contractors have honed their process design skills on revamp projects, where the effect on capital and operating cost of small equipment changes has been studied. Now they are able to turn these skills to a grass-roots project.

Chemistry of hydrotreating

The basic chemistry of hydrotreating is to remove sulphur by combining with hydrogen to form hydrogen sulphide, but the deeper desulphurisation of distillate to meet the new specifications requires increases in the severity of operating conditions. Hydrogen is an expensive reagent and its consumption must be optimised through use of a recycle loop around the reactor. Secondary functions of hydrotreating are to remove other impurities (e.g. nitrogen), to convert olefinic and aromatic compounds into straight chain compounds and to crack high boiling components into lower molecular weight, lower boiling point ones. These secondary reactions also require enhanced operating conditions.



A CAD representation of the BP Hydrofiner at Grangemouth

AMEC engineering designers using CAD systems

The use of high reaction temperature is limited by the need to avoid thermal degradation of the distillate (causing product colour problems, coking of catalyst and fired heater systems, and deactivation of the catalyst). To achieve higher severity therefore requires increases in operating pressure; typical reactor conditions will be up to 390°C at pressures of 60 to 100 bar in the reaction loop. The combination of high pressure, temperature and the corrosive nature of acid gas requires use of expensive stainless steels within the loop.

The requirement of plant design has always been to achieve process objectives safely, operably and economically. For the hydrotreater, safety features need to include the containment of high operating pressures of the reaction loop, the supply and use of highly flammable hydrogen, and the presence of very poisonous hydrogen sulphide.

Particular attention on safety needs to be given to:

- plant layout to segregate high and low pressure areas, sweet and sour gas systems
- the valves and connections between the high pressure reaction system and the low pressure product recovery system
- the design of overpressure release systems to cope with potential breakthrough of high pressure material
- the possible advantages of segregation of sour gas and sweet gas flare systems

Design features

In addition to the sulphur specification, secondary specifications on product flash point and on water content must be attained. Achievement of these will affect the design of the product recovery system and whether to use a reboiled or steam stripped column for removal of hydrogen sulphide and light ends.

Operability

A grass roots hydrotreater is not a stand-alone unit. Its interaction with upstream and downstream process units must be considered in the design. These interactions include the both the effect on refinery balances and the hydraulics of hydrogen and distillate feed supply, off gas treatment, sulphur recovery and fuel gas, cooling water, air and steam etc. Within the unit, operability aspects must be investigated on options for reactor preheat systems, balancing heat integration with operating flexibility (at start-up and shutdown, change of throughput).

Integrated with operability is the need to optimise the economics of the process, where operating costs must be balanced with investment cost. Process design considerations include optimisation of use of hydrogen, choosing make-up gas compression (and purge rate) against recycle gas compression, also the heat recovery system for product separation, options to achieve high hydrogen purity in the recycle gas by cooling reactants to low temperature, acid gas scrubbing or absorbtion techniques. Also with major economic effect is the selection of compressor and heat exchanger configurations.

BP Grangemouth

One of AMEC Engineering's projects during 1993 has been on the hydrofiner at BP's Grangemouth refinery. After being awarded the front-end engineering design, this was followed up with the engineering, procurement and construction (EPC) contract. The £60 million gas oil hydrofiner unit, is expected to come on stream in 1996, when it will have a processed diesel capacity of 232 cubic metres per hour, or 35,000 barrels/day.

At present, BP's Grangemouth refinery processes Forties pipeline crude, with a nominal distillation capacity of 200,000 bpsd. The hydrofiner gas oil treater system will enable BP to produce automotive gas oil at 0.05 percent wt sulphur, by 1996 and heating oil to be produced at 0.1 percent wt sulphur by the late 1990s.

The hydrofiner will be constructed in a location within the refinery, previously occupied by redundant storage tanks. It will be fed with straight-run and cracked gas oils directly from the upstream units or from intermediate tankage.

At the same time as the BP front-end study was being carried out, AMEC began another study for a new distillate hydrotreater plant at the Milford Haven refinery of Elf Oil UK Limited/Murco Petroleum Limited.

This distillate hydrotreater plant will use technology licensed by the Institut Français du Pétrole.

Sir Alan Cockshaw, Chairman of Amec (second from right) visits the NEREFCO project

Conference report

Practical implementation of EC Gasoline Vapour Emission Control Directives

The Institute of Petroleum held a one-day conference on 25 November which focused on the requirements of the forthcoming EC Stage 1 and Stage 2 Directives. It dealt with the different options available to achieve compliance with these Directives and the technical aspects of implementing them. On a highly topical subject, this conference, with its associated exhibition, attracted delegates from many sectors of both the UK and overseas industry.

Summaries of most of the papers follow here, with the exception of 'Rail Tank Car and Marine Vessel Loading' by Mr G van Ophem, Shell International, and 'Vapour Collection Systems and the Effectiveness of Safety Investments', by Mr M de Groot, Shell International.

The Conference Chairman was Mr RA Mills, Head of Air Quality Division, Department of the Environment, who introduced the keynote speaker, Mr J Henningsen, Director, DG XI, Commission of the European Communities.

Keynote address

Mr J Henningsen, Director, DG XI, Commission of the European Communities

Mr Henningsen thanked the Chairman for his welcome and the Institute for giving him the opportunity to explain from the point of view of the Commission some of the background to the negotiations with industry which had led to the present situation of the Stage 1 and 2 Directives.

In his presentation he covered some of the political as well as the technical aspects of the Directives' development.

First he drew attention to the fifth environmental action programme which having been put forward early in 1992 had since received the blessing of both the European Parliament and the Council of Ministers. thereby becoming a 'guiding star' for the foreseeable future.

A key element of the programme is to ensure that environmental policies are made as compatible as possible with the market mechanism by the introduction of economic incentives and disincentives. Broader cooperation with industry and greater openness are also key elements in the approach being followed. Mr Henningsen felt that the tension of the past concerning who should do what on environmental policy was gradually easing.

On the question of subsidiarity he pointed out that this principle was already well established in regard to the environmental polies of the Community. The new articles on environmental protection which were introduced with the Single Act in The Treaty of Rome in 1987 contained very precise requirements that the environment policy of the Community should respect the fact that there are a number of actions which are better taken at the national or even local level. The Commission has moved away from very detailed technical regulations into more framework-type legislation which leaves a lot of the practical implications to be carried out by member states. Some complications arise from this approach as some states have very weak implementation bodies.

Conversely he instanced Germany as a member state which had successfully employed the principles of subsidiarity, whilst pursuing a high-profile environment policy within its own borders.

Stages 1 and 2

Mr Henningsen then mentioned a number of points determining the framework of the Stage 1 and 2 proposals. Firstly, the Community and the member states are obliged to meet a global overall 30 percent reduction target on volatile organic compound (VOC) emissions due to the VOC long-range transport of air pollution convention.

Secondly, there are local or possibly regional air quality requirements which are in the process of being formulated.

A first directive has been adopted which requires systematic monitoring of ozone levels, necessitating certain actions to be taken in case of high ozone concentrations. This is certainly foreseen as the prelude to a more comprehensive follow -up in the form of a framework directive which will set air quality objectives. Meeting the local air quality aspect will be a very important element in this.

The third constraint on anything to be done on VOC reductions is the internal market aspect which is especially important when it comes to the distribution of fuels, physically and economically. This does not affect the

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Vapour Recovery Unit at Nerefco Refinery in Pernis

John Zink designed the Vapour Recovery Unit shown especially for the Nerefco terminal at Pernis to recover vapours from the loading of gasolines, diesel, jet fuel and additives. The unit uses a combination of adsorption onto activated carbon beds, regeneration by vacuum, followed by absorption into a circulating flow of gasoline to recover these valuable vapours and return them to storage. This process is simple and the unit requires very little monitoring and maintenance. The unit recovers 25 times more energy than consumed and is the first unit of its kind in Europe to deal with very stringent legislation. Every year, it will prevent over 1.000.000 kg hydrocarbon vapours from being emitted into the atmosphere. John Zink manufactures all units for Europe at their works in Luxembourg. The units are skidmounted and shop-tested, keeping on-site work to a minimum.

Vapour Recovery Unit in production in Luxembourg

A Division of
KOCH
KOCH ENGINEERING COMPANY INC

John Zink Company Limited
High Common
77 Woodside Road
Amersham
Bucks HP6 6AA
Telephone: 0494 434100

United Kingdom to the same extent as it does Continental Europe. Legislation must allow road and rail cars to deliver gasoline throughout the Community. A common standard for vehicles carrying gasoline will be a tremendous advantage to the vehicle manufacturers.

In all EC legislation concerning important industrial or economic sectors, there is the question of the level playing field, to avoid distortion of competition. Mr Henningsen felt there was perhaps a tendency to overemphasize this argument, although he understood its psychological importance in helping governments persuade their industries of the need for certain measures by showing that they would be similar throughout the Community.

His fourth point was the requirement for proper cost-benefit or cost-effectiveness analysis before the Commission puts forward its proposals. In most cases it is extremely difficult, if not impossible, to quantify in economic terms the benefit from measures being taken to the same degree of accuracy that one can address the costs. However cost-effectiveness can normally be assessed to a significantly higher extent and he felt that particularly on VOC reductions there is a golden opportunity to try to make sure that the measures we take will generally be those that are most cost-effective, both for the global reductions which we have to perform and also for local reductions required in member states or in regions in order to meet ozone air quality requirements.

Fifthly, an important parameter in Community legislation, or any proposals it makes, is that the Community is basically a political cooperation between member states which finally depends on agreement between democratically-elected governments. The Commission therefore has to listen to the soundings coming from these states – an issue of some importance for the present proposals.

His sixth and final point was that the process of introducing new Community legislation was quite lengthy. This fact is partly due to the institutional structure of the Community but also due to the fact that the Commission – contrary to the popular view – has considerably fewer staff than the national administrations.

Turning more directly to the two VOC proposals. Stage 1 achieved a common position in the June Council of Environment Ministers, is now on its way to the Parliament for a second reading and will come back to the Environment Ministers shortly, hopefully to be adopted in the March Council under the Greek Presidency.

Stage 2 is not yet a proposal but the draft is being translated into the nine languages and is on its way to the Commission. It is foreseen that it should be adopted before the end of December. Mr Henningsen was hopeful it will have left the table of the Commissioners before the end of January 1994.

These two pieces of legislation are expected to be main instruments in trying to meet the objectives on VOC emissions, whether they flow from the VOC protocol or from the need to meet local or regional ozone air quality norms or levels.

However, over the next 10 to 20 years there are a number of uncertainties which have to be clarified. One of these uncertainties relates to the contribution of VOC emissions from car emissions. What is not known is the number of cars without catalysts that will still be on the road in the years to come. We know pretty well the number of cars without catalysts five years from now, but less certainly how many cars will still be on the road five years later; the effort to try and produce cars with a longer lifetime runs counteractive to the efforts to have cleaner cars on the road.

Exhibition of equipment suppliers

The overall volume of car traffic, which is a major contributor even with improved emission norms, 20 years from now is unknown; nor do we know fuel consumption.

Fuel consumption is closely linked with tailpipe emissions of unburnt hydrocarbons. The Americans are starting a major research project with the aim of reducing fuel consumption significantly over a 10-year period. If successful this will have a major impact on overall VOC emissions.

We do not know sufficiently well the ozone levels throughout Europe nor the mechanisms behind them to predict exactly the reductions to achieve a specific improvement.

These are the reasons for the approach proposed by the Commission which allows for some flexibility in implementation of the Directives. For Stage 1 the implementation period will be over some nine years. Mr Henningsen believed the Directive was necessary to the extent proposed but that there were still possibilities to go further if needed. He pointed out that the Commission had not accepted the German proposals on the emission value for the VRU or terminals. The considerable additional cost and energy consumption for a very small further reduction in emissions did not meet the Commission's requirements for cost effectiveness.

A major problem with Stage 1 had been to make sure there would be parallel action would be taken at terminals and on vehicle equipment, as the distribution system for gasoline is very different in the various member states. In some most of the gasoline is distributed by the oil companies, with a close link between the terminal and the truck, Other member states have a very large part of their distribution taken care of by individual truck drivers who pick up product normally at the same terminal or at different terminals but certainly never in a way which would allow a single company to coordinate measures taken at both the terminal and on the vehicle. A need for common fittings was essential and Mr Henningsen hoped he felt they had dealt with the issue successfully.

Turning finally to Stage 2 he gave an appreciation of the conflicting arguments concerning the large carbon canister, which he fully understood. The reasons for going ahead with Stage 1 were:

1 **An effective large carbon canister** did not exist whereas Stage 2 technology was a marketed and proven technology.

2 **Some member states were** already implementing Stage 2.

3 **It would not be possible to** introduce the carbon canister on a selective basis as can be done with Stage 2.

Having stressed the cooperation which had taken place between member states, their national experts and those in the car and oil industries, Mr Henningsen expressed the opinion that the present Stage 2 proposal represented a reasonable balance, taking into account the considerations for the functioning of the internal market, cost-effectiveness and subsidiarity – on top of basic environmental considerations.

Legislative proposals

By Les White, CONCAWE (Presented by Brian Smithers)

The EC Stage 1 Directive proposes emission controls to be applied to gasoline storage and handling in the chain from the refinery to the service station. Implementation will be phased depending on the gasoline throughput. Current proposals are for three phases of three years each, with the first phase starting one year after adoption of the Directive. Thus it is envisaged that all of the control measures proposed will be in place by the middle of 2004.

There have been a number of changes to the proposals since the Directive was adopted by the Commission in the summer of 1992. These reflect the significant national variations in gasoline marketing due to topographic, demographic and historic influences.

For gasoline terminals, the proposals require the installation of vapour collection and recovery systems of road, rail and barge loading operations. Because of the greater collection efficiency afforded by bottom loading, this will be mandated for road tanker loading. The current phasing proposals are:

Phase 1
Road, rail, and barge loading terminals with a gasoline throughput in excess of 150 kt/a have to install a vapour recovery unit (VRU). For road loading terminals, at least one bottom loading gantry must be installed.

Phase 2
Road and rail loading facilities with a gasoline throughput in excess of 25 kt/a require a VRU. Road loading terminals require at least one bottom loading gantry.

Phase 3
Road and rail loading facilities with a gasoline throughput in excess of 10 kt/a require a VRU, and all remaining road loading gantries need to be converted to bottom loading.

The original proposals had a lower throughput threshold (50 kt/a) for the first phase and required all gantries at impacted terminals to be bottom loading. This meant that about 95 percent of all gasoline road loadings would have been captured and hence about the same percentage of the road tanker fleet would have needed to be fitted for bottom loading. This raised concerns in some member states where the road tanker fleet is owned by a large number of small private companies.

The proposed changes will bring considerable relief to the tanker owners. It also results in a more even spread of the implementation of vapour recovery over the three phases. However, the requirement that all gantries need to be converted to bottom loading only at the end of the third phase will result in VRUs being underutilised, and hence give significantly lower returns on investment, over a number of years. Any reduction in the throughput threshold will only exacerbate this problem.

It will be noted that barge loading terminals with a gasoline throughput less than 150 kt/a have been derogated. Concawe data (Report 92/52) indicate that well over 95 percent of all loadings will be controlled at this threshold. The cost-effectiveness of controls decreases sharply for vapour emission controls at sites below this throughput level. There are also major safety concerns about the installation of this equipment at poorly utilised barge loading facilities.

Emission controls on all above ground gasoline storage tanks are also proposed. Control options include secondary seals on external floating roofs, fitting of internal floating roofs in fixed roof tanks or connecting these tanks directly to a VRU. In addition, all tanks with a floating roof must be painted with a high reflectance coating. The throughput threshold for the three phases are 50, 25 and 0 kt/a. Thus by the end of the first phase well over 70 percent of gasoline storage tanks will require vapour emission controls.

At service stations, vapour collection (Stage 1b vapour balancing) must be undertaken during road tanker discharge into the underground storage tank. The proposed timetable for this is:

Phase 1
Service stations with gasoline throughputs in excess of 1,000 cubic metres per annum as well as all sites , irrespective of throughput, located under working or living accommodation;

Phase 2
Service stations with a gasoline throughput in excess of 500 m^3/a;

Phase 3
Service stations with a gasoline throughput in excess of 100 m^3/a.

This means that about 60 percent of the service stations in the EC states will require the installation of Stage 1b by the end of the first phase. There are, however, very significant variations in the gasoline retailing networks between member states, with the 60 percent figure being an average in the range between 90 percent and 33 percent.

These national variations offer a challenge to the European legislators. Without a doubt, these very significant variations in national retailing networks will offer even more of a challenge when the Stage 2 regulations are being formulated.

Storage tank emission controls

By Brian Smithers, BP Oil Europe, and Chairman, IP Vapour Recovery Committee

The emission control requirements within the proposed EC Stage 1 Directive for existing gasoline storage tanks are:

- **For floating roof tanks – fit a secondary seal** to achieve an overall emission reduction efficiency of at least 95 percent compared with a fixed roof tank of similar size fitted with pressure/vacuum (P/V) valves.
- **For fixed roof tanks – either install** an internal floating roof with an emission reduction efficiency of at least 90 percent or connect to a vapour recovery unit (VRU).

Although the Directive specifies efficiencies for floating roofs, it is not possible to measure these in situ. It is proposed that a design standard should be jointly developed by the manufacturers, operators and administrators. Roofs installed to this standard could then be considered by authorities to comply with the intent of the Directive.

There are a number of design considerations when retrofitting such equipment. For example, when a secondary seal is fitted, it is important that the height of the foam dam is checked to ensure that it protrudes above the top of the seal assembly.

When an internal floating roof is installed, it is recommended that the P/V valves are removed and open vents

fitted to ensure that the vapour concentration in the ullage space usually remains below the lower explosive limit. The Institute of Petroleum will be publishing a Code of Practice for internal floating roofs during 1994.

If the tanks are to be connected to a VRU, then invariably the vapour collection pipework can be combined with that from the loading system to form a vapour balancing system. In this the vapours displaced from the road tankers during the loading are fed back to the storage tank from which the product is pumped. When designing a vapour balancing system, the following need to be taken into consideration:

- **The storage tanks are the weakest** part of the system. The vapour collection and recovery systems must be designed to ensure that the pressure drops across them at maximum vapour flow rate do not result in the pressure in the storage tank exceeding the setting of the pressure relief valve;
- **The settings of P/V valves should** be checked to ensure correct operation;
- **Conventional dip hatches can no** longer be used as the opening of these would result in vapours being emitted to atmosphere. Tank gauging and closed sampling systems, therefore, need to be installed.
- **Condensation is liable to form in** vapour lines conveying saturated hydrocarbons. Low points in such lines should be minimised and fitted with drain points.
- **Connecting tanks into a vapour** balancing system means connecting all the tanks together. If an ignition occurs within one tank, it could spread to all the other tanks. It is recommended that a risk assessment is undertaken to establish what safety measures are required eg. installation of detonation arresters in vapour lines.

If a site has existing fixed roof tanks fitted with P/V valves, then one has a choice of retrofitting internal floating roofs or installing a vapour balancing system. The decision on which option to take will depend on a number of factors, for example:

- **The pressure ratings of the tanks** – low pressure or atmospheric rated tanks will require strengthening;
- **The storage tank farm layout** – long vapour lines can add considerably to the system cost;
- **The tank fill rate – the maximum** vapour flow rate to the VRU in a balanced system, and hence the size and cost of the VRU, depends mainly on the tank fill rate;
- **Restrictions on storage capacity** – fitting internal floating roofs will restrict the working storage capacity available as they must remain floating to maintain their emission control performance;
- **The ratio of volumes of diesel** fuel to gasoline being loaded at the site : it is recommended that diesel tanks are not included in a terminal vapour balancing system, so the vapours collected during diesel loading are in imbalance in the system which must be processed directly by the VRU.

The Directive also requires that gasoline storage tanks not connected to a VRU must be painted with a coating having a heat reflectance of at least 70 percent. This means that tanks must be painted white or very pastel colours instead of the traditional grey. There are 12 colours, apart from white, listed in British Standard BS 4800, 'Specification for paint colours for building purposes' which have a reflectance greater than 70 percent.

Well over 70 percent of the gasoline storage tanks will need to be fitted with emission controls within the first three year phase of implementation of the Stage 1 Directive. A great many of these will be fitted with floating roofs and hence will require to be painted in a light colour. Painting controlled tanks in pale colours, however, gives very little environmental benefit. Because of this the oil industry would have pre-

ferred to repaint its tanks as required under existing maintenance schedules, with the proviso that all would have done by the end of the third phase.

In conclusion, traditional tank emission controls will continue to be used but it is proposed that approved design standards for floating roofs need to be developed to ensure that installations meet the terms of the Directive. Connecting tanks to a VRU may be an effective option at some terminals but this solution needs very careful design, with particular emphasis on pressure drops through the system and the safety issues.

Truck Loading

By Robert Harris, Downstream Oil, Shell UK Ltd and Chairman, IP Road Transport Committee

To ensure that there are no uncontrolled leaks of vapour from a truck when loading petroleum spirit, the truck to gantry interface is defined in Annex IV of the VOC Directive which is based on the IP Bottom Loading Code.

Three new details have crept into this Annex IV specification. Firstly, the Vapour Recovery Unit and gantry installation in general must not generate a counter pressure of more than 55 millibar, as measured at the vehicle side of the vapour collection adaptor; each tanker must carry an identification plate which specifies the maximum number of loading arms which may be operated simultaneously, such that no vapours are released via the compartment P/V breather valves with this 55 mbar counter pressure.

Secondly, there is the option of fitting a five-wire (instead of the current UK industry standard two-wire) overfill detection system.

Thirdly, loading must not be permitted unless there is a free passage of vapour to flow from the vehicle to the plant vapour collection system.

To ensure this condition is met, either pressure balanced foot valves (sequentially opened after the vapour vents), or a control system which guarantees the vapour vents are opened, may be used with non-pressure balanced foot-valves. The conventional non-pressure balanced control system cannot provide this assurance since they will be forced open by incoming product; a terminal operator may therefore need to review his own fleet in this respect and also to specify this when allowing 'foreign' (i.e. third party, distributor or contractor) vehicles into his terminal to load.

The issue of five or two wire overfill systems does not present a problem for the UK operator, once he has found a place on his tanker to attach yet another identification plate, as required in Section 3.5 of the Annex.

The 55 millibar requirement presents tanker operators with quite a challenge; virtually all petroleum spirit tankers in the United Kingdom are designed as 'vented, non-pressure road tankers' in accordance with the HSE Approved Code of Practice. This results in a tank design which has a maximum design pressure of 0.35 bar (5.2 psi) and a fire-engulfment relief valve (as part of the man-lid) is built in to ensure that the tank does not rupture under this condition.

To ensure that the combined effect of its static head and vapour pressure will not force the product out of the man-lid, should the tanker overturn, the pressure vacuum breather valve has to be set to relieve below 75 mbar, with 70 mbar being the usual figure to allow for production tolerance. However, designing a valve to relieve at this pressure results in a start-to-lift pressure of approximately 65 mbar.

Referring back to Annex IV of the Directive, this leaves just 10 mbar in total available in each compartment to drive the vapour off the truck with a conventional P/V valve. All this vapour has to be driven through the compartment vapour vent and its hood, along the coaming and through the down-tube to the vehicle side of the vapour recovery adaptor, with just 10 mbar to drive it, otherwise the P/V valve will open.

Compliance

When bottom loading was introduced in the United Kingdom eight years ago, little thought was given to whether the truck's vapour recovery system would work or not, as long as the required bits were bolted on; now much more attention is being devoted to how the vapour system works and its detailed design.

The industry – operators and manufacturers – have some work to do together to lay down an acceptable and universally reproducible factory test procedure to meet the 55 mbar standard. The effects of the use of air (about 60 percent of the specific gravity of a vapour/air mixture) as the test medium, and of any vapour generation will clearly have to be considered. It will then have to be ensured that what is developed in the United Kingdom is also appropriate and agreed in the rest of Europe; ideally this should be part of the new European standard for road tankers being produced by CEN/TC 296; this will have a specific section on the inspection and testing of road tankers.

The problem facing operators is what to do with existing tankers – or is it? Article 5 section 2 by default excludes existing bottom loading tankers from having to comply with the Directive. Interpretation of Annex II paragraph 4, on the other hand, does not specify that a leak of vapour occurring on a truck would require an installation to be closed down. Terminal operators may therefore need to consider spelling out to 'foreign' operators picking up from their terminal that all vehicles, however old they are, need to comply with the vapour tightness and 55 mbar rules, whether or not the third-party operator deems them to be exempt.

To meet the proposed standard, one option may be to consider dual rated or duplicated PV valves such that advantage may be taken of using the higher pressure capability of the road tanker when in the upright condition to drive vapour off the truck to the vapour recovery connection.

Alternatively, manufacturers and operators may have to look at their tankers with a view to improving the design of the vapour flow path, but reworking of existing coaming connections is expensive and reworking of the down pipe to coaming joint even more so.

Article 5 paragraph 1 (d) requires the inspection of tankers' P/V breather valves; the pressure testing of road tankers' P/V breather valves. The pressure testing of road tankers has already been started by some operators and experience has shown that tankers do tend to have developed leaks over their years in service but that, once corrected and properly maintained, a tanker should comfortably last 12 months between tests without exhibiting serious leaks.

Such a test inevitably tests the P/V breather valve seals (and valve to tank joint as long as it has not been removed for the test) as indeed it does the emergency/fire engulfment valve seal. Further testing of the valve is therefore superfluous. Tests of both leading makes of P/V valve in the United Kingdom to their latest respective designs in service in bottom loading operation have shown that they also retain their product retention feature in the event of a rollover. The required periodic inspection of vacuum pressure valves should therefore be external for security and condition, as Article 5 section 1 (d) implies, and changed every six years as part of the Transport Regulation 7 inspection.

What is required is the development of practical test criteria for vapour tightness taking into account the size of the component being testing (a 15 metre road tanker), the design standard of the equipment and the low pressures being considered.

Dipping

Finally, a few words on dipping. This is going to be allowed indefinitely on existing vehicles and those which come into operation four years after the implementation of this Directive. New technology, procedure or methods will be needed to keep the gasoline loop closed, and the 'sealed parcel' concept looks to be the most promising at this time, providing the cost can be realistic.

In summary, the industry needs to develop the right test procedures and standards for vapour flow pressure drop in the tanker's vapour system; similarly for the vapour tightness testing of the tank; and then designing the tanker (with high pressure P/V valve setting and/or gas-flowed vapour paths) to meet the 55 mbar requirement. It will be necessary to ensure throughout that the standards and legislative aspects of this Directive, and those of ADR and CEN 296, are consistent and compatible with one another.

Then, and only then, can operators know what needs to be done to existing bottom loading tankers to ensure vapour recovery requirements are effectively met.

Annex IV to the Directive

By Rudy Jacobs, BP Oil Europe and Chairman of CEN 296 WG4A

Trucks, and more specifically dangerous goods trucks, have been over the years designed, converted and adapted in the different European countries according to a multitude of local, national and international legislation. For many countries (with the exception of the United Kingdom and Ireland) most of the regulations for dangerous goods are based upon, or at least refer to, the ADR/RID. But as those regulations are not a full technical specification, a lot more legislation and local regulations are involved in the transport of dangerous goods and the design, construction and operation of the trucks.

These include construction and use regulation, health and safety at work legislation, environmental legislation etc.

This probably also affected how the market requirements for distributing petroleum products also developed in varying ways. The result is that a German truck is not comparable with a UK truck and a Portuguese truck is considerably different from a Danish tanker.

Many sub-divisions, according to design and equipment, are possible:

- Kerb side loading & kerb side discharge

  versus

- non kerb side loading and kerb side discharge
- trucks with PD or turbine meters
- trucks with dipsticks or ullage meters
- trucks without any measuring equipment whatsoever.

Metering

We basically see two main areas in Europe as far as metering is concerned.

The northern part, with mostly 2 PD meters, one for middle distillates and one for motor spirits, and very complicated air eliminating system. There is a strong wish to get rid of the actual metering sys-

tems on board, as they are costly and expensive to operate and maintain.

The southern part of Europe, with dipsticks, ullage meters, calibrated compartments etc. are expecting the solution of all their distribution problems from meters on the trucks.

We also of course have the peculiar UK systems with the dipstick which are known on the continent for their tradition and conservatism but have the best compromise for the time being. And I am certainly not the person to say that they are wrong.

Overspill detection systems in Europe include:

- 2 wire NTC/optic systems
- 5 wire optic systems
- 2 wire PTC systems
- On-board systems optics (not compatible) with or without transmission to terminal
- No systems at all, or any onboard system.

In some countries tank trucks need even more than these systems on the trucks to accommodate all gantry-based overspill systems and one extra for those terminals without an overspill system.

All possibilities from 2.5 inch up to 5 inch bottom valves and pipe work can be found on European trucks.

Gross vehicle weights between 38 ton and 50 ton (56 ton in Sweden) all on different axel combinations.

It will not surprise you that the tops of the trucks are very different as well. These differences are due to the different operating conditions and the local legislation, eg.Germany forbid the use of self-lifting manholes or emergency liquid relief valves. However, it is a normal industry practice to have them fitted in the United Kingdom (legislation?). The P/V valves settings are an even more foggy area. The differences between industry practice and the legislation is so wide that one sometimes questions the need for it.

Industry practice between +50 hPas (mbar) and -10 hPas to + 200 hPas and -100 hPas.

There are several tank top designs currently in use:

- Vapour line from each compartment
- manifolded vapour line
- two manifolded vapour lines
- internal single vapour line.

For the vapour adaptor coupler we see a variation from a standardised self-sealing cam and groove pneumatic operated valve to an open hole at the end of the pipe and with a local type of coupling.

Tests have revealed that the internal pressures in the compartments are practically limited to the P/V valves settings if the rest of the tank top equipment is as tight as it should be. The actual pressures during loading are largely depending upon the type of venting valves, flame detonation arresters and dimensions, configurations and other valves in the vapour return lines.

The conclusion might be that if we want to be sure that all vapours are recovered the P/V valve setting and/or the maximum allowed internal working pressure is crucial for the desired flow rates. Standardisation in Europe is not imminent.

The United Kingdom might not face immediate cross-border trade (other than between England and Scotland) and will therefore be less affected in the short term but as Europe is desperately trying to standardise and those standards will be written into European CEN standards, they might become mandatory in the United Kingdom as well.

Annex IV

CEN is largely driven by the VOC directive and more specifically by Annex IV. This technical annex proposed by the European Petroleum Industry Association is a general guideline for the operating conditions of petroleum tankers.

As with so many documents Annex IV is more a political compromise than a technical specification. It tells how to do things but the practical realisation might differ so much that interoperability will not be guaranteed.

Annex IV specifies in relation to the design and operation of road tankers:

1. **Loading coupler API 4" Male (ok** for GB/B/NL/D/A/Sp)
2. **Vapour collection coupler Cam** and groove 4" Male (ok for GB/B/Sp/P...)
3. **General operating conditions**. 2500 l/min (not allowed in some countries). 55 mbar (hPa) max. back pressure at vapour recovery connection (vehicle side) might be not enough in some existing installations.
4. **Identification plate: probably a** derivation from the safe loading pass scheme used only in the United Kingdom.
5. **Overfill detection equipment.** 2 or 5 wire NTC/optic equipment. (only in use in the United Kingdom, Belgium and Spain and partially in the Netherlands)
6. **Location of the loading equip**ment, liquid couplers, vapour return coupler overspill detection equipment etc.
7. **Two interlocks: The overspill** detection equipment and vapour hose connection.

Annex IV does not specify P/V valve settings, kerb or non-kerb side loading, liquid emergency relief valves, or drive away protection. It is only dealing with Stage 1a (terminal into truck) – not Stage 1b (truck into customer storage tank). We might expect that EUROPIA has to produce a sort of Annex V for this as well.

Personally I would think that, notwithstanding the changes to be made in the United Kingdom to meet the expected European standards, the industry practice here is far more in line with the standards and regulations as they are in the process of being implemented compared with the rest of Europe.

CEN

Commission Europien pour le Normalisation (CEN) will be officially asked to produce standards to comply with the VOC directive when approved, if the actual standards are not sufficient. There are already a number of technical committees in CEN dealing with standardisation of handling dangerous goods which are producing standards which might be applicable on the design and construction of our road tankers, our storage installations and our operations.

There are fears that the regulations will be so complicated and opaque that a couple of countries have proposed to reconvene CEN TC/12 and to change its title to 'Materials and equipment for petroleum industry and natural gas production'. This TC would then have the overall coordination of the standards applicable for the equipment to handle petroleum products from production to end-user.

As this TC is not yet reinstated, the most important CEN TC for the moment is CEN TC/296 – Tanks for the transport of dangerous goods.

There are five working groups covering design and construction of non-pressure and pressure tanks and their service equipment.

Terminal vapour collection and recovery

By Andrew Sangster, Esso UK, and Chairman, IP Terminal Installations Committee

Sizing of systems

In order to provide a cost-effective vapour recovery installation, it is necessary to analyse and understand the operations that generate vapour on a site. The first step is to identify all

FORTHCOMING EVENTS

January

11th
London: 'Deep Water Pipelaying'. Details: The Editorial Assistant, The Institute of Marine Engineers, 76 Mark Lane, London EC3R 7JN. Tel: (071) 481 8493. Fax: (071) 488 1854.

12th
Aberdeen: 'Marine Fouling and the Cost Benefits of Accurate Prediction'. Details: Society for Underwater Technology, PSTI House, Exploration Drive, Offshore Technology Park, Bridge of Don, Aberdeen AB23 8GX Tel: (0224) 823637. Fax: (0224) 820236.

12th
Leatherhead, UK: 'Restoration of Land Following Pipeline Installation'. Details: The Pipeline Industries Guild, 14/15 Belgrave Square, London SW1X 8PS. Tel: (071) 235 7938.

13th-14th
London: 'PGS '94 – (2nd Annual) Cost, Competition and Regulation in Power Generation & Supply'. Details: IIR Ltd, 28th Floor, Centre Point, 103 New Oxford Street, London WC1A 1DD. Tel: (071) 412 0141. Fax: (071) 412 0145.

15-16th
London: 'Strategy and Economics in the North Sea Oil and Gas Industry'. Details: IIR Ltd, Industrial Division, 28th Floor, Centre Point, 103 New Oxford Street, London WC1A 1DD. Tel: (071) 412 0141. Fax: (071) 412 0145.

16-18th
Bahrain: 'The Second Annual Middle East Petroleum and Gas Conference'. Details: IBC Conferences, 545 Orchard Road, #12-01, Singapore 0923. Tel: 65+732-1970. Fax: 65+733-5087.

18-20th
San Antonio, Texas: 'Fossil Plant Inspections Conference'. Details: Lori Adams, Conference Coordinator, Electric Power Research Institute, P.O. Box 10412, Palo Alto, CA 94303, USA. Tel: (415) 855 8763. Fax: (415) 855 2041.

19th
London: 'Safety Analysis and Techniques Required for the Shipping Industry'. Details: The Institute of Marine Engineers, The Memorial Building, 76 Mark Lane, London EC3R 7JN. Tel: (071) 481 8493. Fax: (071) 488 1854.

19-20th
Aberdeen: 'Improving Efficiency and Reducing Operating Costs Through Cost-Effective Offshore Maintenance'. Details: IIR Ltd, Industrial Division, 28th Floor, Centre Point, 103 New Oxford Street, London WC1A 1DD. Tel: (071) 412 0141. Fax: (071) 412 0145.

21st
London: 'The New Gas Market: Competitive Opportunities and Challenges'. Details: Brenda Ribero, The Economist Conferences, 40 Duke Street, London W1A 1DW. Tel: (071) 830 1093 Fax: (071) 931 0228

24-25th
London: 'Coalbed Methane Extraction' Details: IBC Technical Services Ltd, Gilmoora House, 57-61 Mortimer Street, London W1N 7TD. Tel: (071) 637 4383. Fax: (071) 631 3214.

24-25th
London: 'Contaminated Land: Policy, Risk Manage-ment and Technology' Details: IBC Technical Services Ltd, Gilmoora House, 57-61 Mortimer Street, London W1N 7TD. Tel: (071) 637 4383. Fax: (071) 631 3214.

25th
London: 'General Simulation of Power Systems on Offshore Platforms'. Details: The Institute of Marine Engineers, The Memorial Building, 76 Mark Lane, London EC3R 7JN. Tel: (071) 481 8493. Fax: (071) 488 1854.

25-27th
Malta: 'The Mediterranean Oil and Gas Exhibition and Conference'. Details: Spearhead Exhibitions Ltd, Rowe House, 55-59 Fife Road, Kingston upon Thames, Surrey KT1 1TA. Tel: (081) 549 5831. Fax: (081) 541 5657.

26-27th
Aberdeen: 'Oil Spill Prevention and Coordinated Responses'. Details: BICS International, First Floor, Chandos House, 12-14 Berry Street, London EC1V 0AQ. Tel: (071) 490 2076. Fax: (071) 336 7795.

31st
Glasgow, UK: 'National Engineering Laboratories – Engineering Excellence' Details: The Pipeline Industries Guild, 14/15 Belgrave Square, London SW1X 8PS. Tel: (071) 235 7938.

February

2nd
London: 'Today's Lubricants – and how to use them'. Details: Rachel Parkinson, The Institution of Mechanical Engineers, 1 Birdcage Walk, London SW1H 9JJ. Tel: (071) 973 1301. Fax: (071) 973 0182.

8th-9th
London: 'Euroforum: New World of Energy Financing New Directions and Global Perspectives'. Details: Euroforum, 14 Bowden Street, London SE11 4DS. Tel: (071) 793 1230. Fax: (071) 793 1250.

9th-10th
Aberdeen: 'Introduction to Underwater Engineering for Oilfield Operations'. Details: Society for Underwater Technology, PSTI House, Exploration Drive, Offshore Technology Park, Bridge of Don, Aberdeen AB23 8GX Tel: (0224) 823637. Fax: (0224) 820236.

14th-18th
Leeds: 'Spark Ignition Engine Emissions'. Details: Miss Julie Charlton, Department of Fuel and Energy, University of Leeds, Leeds LS2 9JT. Tel: (0532) 332494. Fax: (0532) 332511/440572.

16th
London: 'The Subsea Future: With or Without Umbilicals?'. Details: Knighton Enterprises Ltd., 2 Marlborough Street, Faringdon, Oxon SN7 7JP. Tel: (0367) 242525. Fax: (0367) 241125.

21st
London: 'Offshore 94 – Design and Development for Economic Hydrocarbon Production'. Details: Ms Rhian Bufton, The Institute of Marine Engineers, 76 Mark Lane, London EC3R 7JN. Tel: (071) 481 8493. Fax: (071) 481 9493.

21st-22nd
Aberdeen: 'Cut Operational Costs and Reduce Safety Risks through Demanning & Not Normally Manned Facilities'. Details: IIR Ltd, 28th Floor, Centre Point, 103 New Oxford Street, London WC1A 1DD. Tel: (071) 412 0141. Fax: (071) 412 0145.

22nd-23rd
London: 'Oil Project Finance'. Details: Monique Quant, IBC Financial Focus Ltd., 57/61 Mortimer Street, London W1N 7TD. Tel: (071) 637 4383. Fax: (071) 323 4298.

22nd-23rd
Aberdeen: 'Capitalising on New Opportunities for

FORTHCOMING EVENTS

Cost-Effective Exploration & Development'. Details: IIR Ltd, 28th Floor, Centre Point, 103 New Oxford Street, London WC1A 1DD. Tel: (071) 412 0141. Fax: (071) 412 0145.

23rd-24th
Windermere, Cumbria: 'An Introduction to Remotely Operated Vehicles'. Details: Society for Underwater Technology, PSTI House, Exploration Drive, Offshore Technology Park, Bridge of Don, Aberdeen AB23 8GX Tel: (0224) 823637. Fax: (0224) 820236.

25th
London: 'Coping with the Realities of Operating in the CIS/FSU'. Details: IIR Ltd, 28th Floor, Centre Point, 103 New Oxford Street, London WC1A 1DD. Tel: (071) 412 0141. Fax: (071) 412 0145.

25th
London: 'Non-Operator Status – The Risks and the Opportunities: How to Protect your Investment and Maximise Potential Benefits'. Details: 37 Main Street, Queniborough, Leicester LE7 3DB. Tel: (0664) 424776. Fax: (0664) 424832.

March

8th-10th
Harrogate: 'Liquidex 94' – 5th Liquids Processing and Handling Exhibition. Details: Phil Norgate, Exhibition Manager, DMG Trinity Ltd, Times House, Station Approach, Ruislip, Middx HA4 8NB. Tel: (0895) 677677. Fax: (0895) 676027.

9th-10th
Vienna: 'Distribution of Oil and Gas in the FSU, Pipeline Transmission Systems'. Details: Lisa Bilby, Adam Smith Institute, Conference Division, 11-13 Charterhouse Buildings, London EC1M 7AN. Tel: (071) 490 3774. Fax: (071) 490 8932.

10th
London: 'Used Lube Oil Disposal – Should we Re-Refine it? or Burn it? or What?'. Details: Caroline Little, The Institute of Petroleum.

15th-16th
London: 'Preventing and Managing Emergencies'. Details: Sarah Ashmore, IBC Technical Services Ltd, Gilmoora House, 57-61 Mortimer Street, London W1N 7TD. Tel: (071) 637 4383. Fax: (071) 631 3214.

16th-18th
Hong Kong: 'GasTrade 94' – International Conference on the Natural Gas, LNG & LPG Trades. Details: GasTrade Limited, 82 Rivington Street, London EC2A 3AY. Tel: (071) 613 0087. Fax: (071) 613 0094.

22nd-24th
Birmingham: 'Environmental Technology 1994'. Details: Sara Binns, Reed Exhibition Companies Ltd., 26 The Quadrant, Richmond, Surrey TW9 1DL. Tel: (081) 948 9800. Fax: (081) 948 9989.

23rd-25th
London: 'Regulation & Marketing in the UK Gas Industry'. Details: AIC Conferences Ltd., 63-67 Carter Lane, London EC4V 5DY. Tel: (071) 329 4445. Fax: (071) 329 4442.

23rd-25th
Durban, South Africa: 'Intermodal Africa 94'. Details: Paddy Payne, Baltic Publishing Ltd., The Baltic Centre, Great West Road, Brentford, Middx TW8 9BU. Tel: (081) 847 2446. Fax: (081) 569 8688.

27th-30th
Dubai: 'Arab Oil & Gas Show'. Details: International Conferences & Exhibitions Ltd., Cromwell House, 51-53 High Street, Kings Langley, Herts WD4 9HU. Tel: (0923) 261988. Fax: (0923) 261669.

IP THE INSTITUTE OF PETROLEUM

IP WEEK

FEBRUARY 14

2001 A Sulphur Odyssey: A Review of Likely Sweet Crude Supply and Premia Conference.

IP Contact: Susan Ashton

.....

FEBRUARY 15

7th Oil Price Seminar – Price Formation Around the World.

IP Contact: Catherine Cosgrove

.....

Luncheon at The Dorchester Hotel, London
Guest Speaker: Mr Lee R Raymond, Chairman of the Board and Chief Executive, Exxon Corporation.

IP Contact: Caroline Little

.....

London Branch Meeting: Petrol or Diesel – Which is better for air quality?
P Gadd, Shell International

IP Contact: JM Wood

.....

FEBRUARY 16

Annual Dinner at Grosvenor House, London.

IP Contact: Caroline Little

.....

FEBRUARY 17

Upstream Atmospheric Emissions – Conference.

IP Contact: Caroline Little

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For further information on any of the above events and a registration form, please contact:

The Institute of Petroleum, 61 New Cavendish Street, London W1M 8AR. Tel: 071 636 1004. Fax: 071 255 1472. Telex: 264380.

sources of emission from normal gasoline handling operations – storage tanks, where emissions controls are not fitted, loading facilities and any ancillary tankage handling product meeting gasoline specifications. The next step is to identify peak vapour flows, allowing for any vapour growth as appropriate – usually associated with gasoline demand around public holidays or during the summer in holiday areas.

Consideration should also be given to possible future increases arising from distribution network rationalisations and throughput and exchange deals with competitors. It is very expensive to install vapour recovery so the opportunity should be taken to check whether rationalising existing operations might not only reduce vapour flows to the process unit but also yield other benefits. Two examples are the avoidance of parallel rail-loading during peak road-loading and establishing a more uniform volume profile over 24-hour trucking operations.

Figure 1 shows a typical day shift for many terminals with the largest road-loading peak in early morning followed by a minor peak after lunch. Rail-loading is added at this terminal, operating between late morning and early afternoon. The combined vapour flow including allowance for vapour growth is shown in Figure 2. From this it can be seen that the maximum flow rate occurs during the early morning road-loading.

Vapour storage can be used to reduce processing capacity and can either be in the form of a separate holding vessel (similar to a gasometer) or, in the case of lean oil absorbing technology, in the first liquid-holding stage of the process. Holding capacity can be from a part-day's volume to one or two weeks where pipeline or shipping operations supply a tank balancing system. Figure 3 shows a typical system covering simple loading operations where it is assumed all processing of vapours has to be completed before the start of the next day shift. This assumption determines the most cost-effective processing rate combined with the minimum vapour holding capacity required. Figure 4 shows a similar situation for a tank balancing system supplied by a pipeline operating over a seven-day cycle. Gasoline is received at the beginning of the cycle but other vapour flows occur throughout due to thermal affects on the tankage and imbalances such as loading of diesel onto retail delivery trucks.

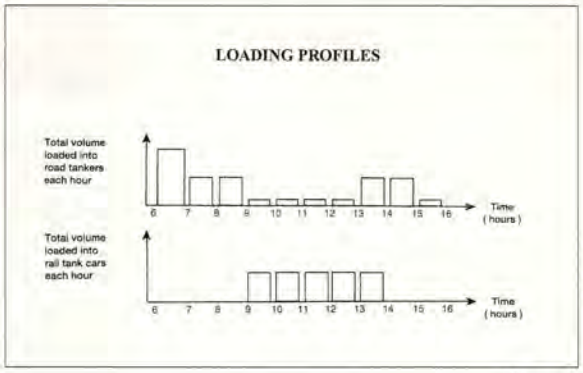


Figure 3

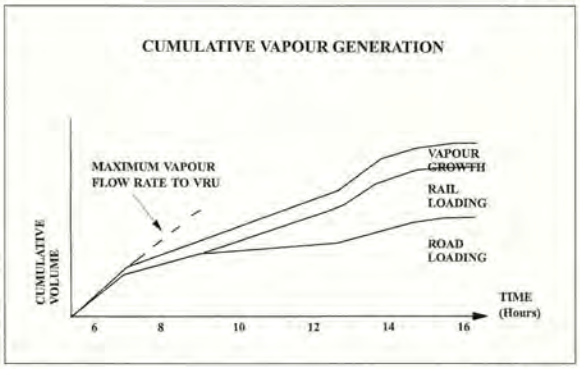


Figure 4

In sizing the system, the maximum vapour flow occurring during its lifetime has to be considered. This may be difficult to predict because of changing distribution patterns, so a decision needs to be made on how future volume increases will be accommodated. Options include pre-investment in a larger facilities, subsequent addition of vapour storage capacity, future increases in the capacity of the process unit or even the addition of a supplementary processing unit.

The processing rate of the unit must also take account of periods of non-availability due to operational needs (such as defrosting of refrigeration systems) and planned maintenance.

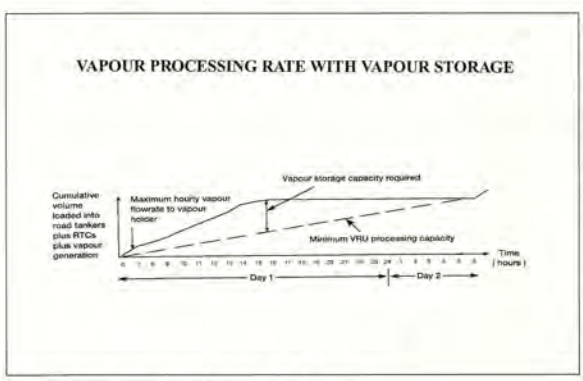
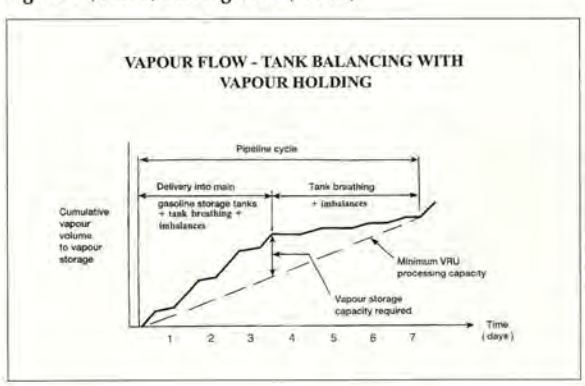


Figure 1 (above) and Figure 2 (below)



Layout of systems

There are a number of considerations in siting the vapour recovery unit. This will depend on type of technology, balancing lengths of vapour header and recirculation/absorber flows from main gasoline storage, siting of ancillary equipment, the need for emergency venting due to unit malfunction and access and storage areas for consumables. Experience indicates that on balance the best location is in or immediately adjacent to the tank farm. The vapour header can be reduced in size by installing a means of driving the vapour but this is a non-preferred solution if it involves mechanical assistance because of safety considerations. However, it would be necessary if a vapour holder were installed. Some technologies require removal of condensate from the header to prevent direct entry to the unit; this can be done using a simple knock-out pot with condensate removal.

Controls and alarms

Operation of the process unit needs to be reduced to a minimum to keep down operating costs. Those linked to simple loading systems can be started by switches on the product loading pumps or the loading arms. Units servicing balancing systems are started by a pressure sensor located in the vapour space of one of the tanks. Once running, all units will be controlled by mechanisms supplied by the manufacturer and will continue until vapour flow ceases.

Alarms and automatic shutdowns of the unit need to be built into the main terminal system. An emergency shutdown facility on the vapour recovery unit (VRU) alone is desirable to avoid unnecessary interference to terminal operations during maintenance and recommissioning. Automatic isolation of the vapour header should be considered in the event of a terminal emergency shutdown.

Remoteness of the VRU and reducing manpower make transmission of alarms and control messages to the terminal

control room essential, particularly given the operational status under pending legislation. It is strongly recommended that no automatic restart facility is built into the control design.

Safety considerations

Because vapour recovery introduces relatively complex operations to terminals and another link between tank farm and loading point, it is recommended that a Hazard and Operability Study should be carried out.

Hazardous Area Classification must also be considered with particular emphasis on the supply of services in and to the processing unit and the venting of vapour under normal and abnormal conditions.

Terminal fire-fighting procedures will need to be augmented with the introduction of a VRU.

Operations and maintenance

The most important operational issue is the one of 'ownership', particularly when availability of the VRU will be a pre-condition for loading operations. Checking of the VRU operation for early warning of malfunction should be built into daily procedures. Required attendance on the unit should be used to encourage responsibility for performance and logging of alarms and faults will help trouble-shooting and build up a service picture.

To date metering of recovered volumes has not been successful but in future the emphasis will switch to checking vent emissions for compliance with legislation. Simple robust systems will be needed for this purpose.

Maintenance arrangements need to recognize that a VRU is a piece of process plant and requires appropriate expertise and experience amongst maintenance personnel. Also continuity of personnel is important in building up competency levels.

Planned preventative maintenance schedules should be developed for all VRUs and rigorously applied if service availability targets are to be met.

In parallel there should be procedures and detailed plans for dealing with breakdowns in order to minimise downtime.

Stage 1b – road tanker unloading at service stations

By P J Lambeth, Mobil European Engineering Services

The paper reviewed work currently under way to prepare a detailed guidance on the service station engineering works which will be necessary to comply with the Stage 1b regulations which cover the balanced transfer of vapour from the underground tanks of a service station back to the road tanker, as it is displaced during the unloading operation.

Designs for new sites

There are two design options available for building in provision for Stage 1b on a new site:

1. Below ground manifolded vent
2. Direct fill single connection per tank.

The below ground manifolded vent system is preferred as the most cost-effective solution for new sites. The system involves collecting all the individual tank vents into a single manifold, then connecting the vapour return connection point and the standard site vent to this common manifold. Pipes are sized to accommodate the preferred vapour flow path.

Generally for a 100mm (4") fill pipe individual vents of 75mm (3") and a manifold of 100mm (4") are required to prevent excess back pressures building up in the system. The site vent should be a 75mm (3") pipe and the return to the vapour connection 100mm (4").

All tanks, including the diesel, must be included in the manifold to ensure the correct operating efficiency of the system.

Other special equipment is also required. The pressure vacuum vent on the vent stack should open on the positive pressure side at 36 mbar and must allow a flow at that pressure of 2,500 1/min. The vent must also open at a vacuum of 3 mbar with a flow of 400 1/min.

At the fill points a valve will be required on the fill cap to allow the safe removal of the cap while the top of the fill pipe is under a small excess pressure.

The road tanker connection point on the site is fitted at the end of the 100mm return line. It should be a 100mm or 75mm high flow fitting complete with a built in flame arrester. The fitting should be clearly marked and sufficiently different from fuel fill pipe fittings to avoid the inadvertent connection of a fuel hose.

With a below ground manifold, it is wise to provide protection against cross-over in the event of an overfill. This can be provided either by means of a reliable overfill prevention system or by providing a ball float valve on the vent at the tank lid.

Existing sites

Existing sites will be split into three standard types related to the type of fills, direct or offset, and the relationship of the fills and the vents. The vast majority of sites will fit into one of these categories.

Two options are available for the retrofit of sites where the vent stack is located adjacent to the offset fills: above ground manifold or below ground manifold.

For sites with vents remote from the fills, again two alternative options are available: below ground manifold or above ground manifold.

Three options are available for direct fill sites: below ground manifold, above ground manifold and return or coaxial adaptor.

The above ground manifold is a very simple and economical way of collecting all the vent lines together into one common line in order to allow the return of the displaced vapour back to the road tanker. The most effective solution for direct fill sites is most likely to be the below ground manifold. Such a manifold could be connected through the tank lid chambers for adjacent tanks in order to minimise forecourt excavation. Existing vents could also be retained in this case.

For small sites or sites with isolated tanks, the most economical solution may involve the use of a coaxial adaptor. The operational restrictions associated with this method will also have to be taken into account.

Design details

The simple aim of the design of the Stage 1 vapour recovery system is to make the preferential vapour flow path between the storage tank and the road tanker. Many factors have an influence on how effectively that aim can be achieved. The most important of these are :

- Fill flow rate: fill pipe size and length
- Number of consecutive fills
- Vapour flow rate : vent pipe size and length, bends and fittings.

In addition factors which affect the amount of vapour generated also have an effect on the efficiency which can be achieved by the finished system. Such factors are fuel temperature in tanker and tank, atmospheric pressure, tank ullage and vapour density.

The design guidance to be prepared will be in the form of a flow chart or nomograph which will enable design-

ers to determine the optimum solution for the particular pipe lengths and sizes they have on their sites. Different charts will be prepared for the various site types.

The main parameters within which the design must work are dictated by the pressure vacuum valve settings on the vent stack. These are at:

+ 36 mbar at 2,500 1/min and
- 3 mbar at 400 1/min.

Increasing these pressures would increase the efficiency of the system and allow the use of smaller sized pipes in the vent and manifold system. Increasing the pressure in the system before venting takes place creates the risk of pushing fuel out of low direct fill pipes and low lying petrol pumps. Changes in the P/V valve settings are not included in the standard solutions to be proposed.

Initial work on head loss for a typical vent system has shown that is that the conventional use of 50mm pipes for vents will present a number of problems in minimising the system head losses, especially on sites with long vent runs. The recommended sizes for use in the underground vent manifold system are 75mm spurs to a 100mm manifold.

Field trials will be carried out to verify the accuracy of the calculation process before the proposed guidance is finalised.

Acknowledgement – This paper was written based on information prepared by an IP working group consisting of:- John Morgan and Colin Leather (Esso Petroleum Co Ltd), Rob Treeby (BP Oil UK Ltd), Spiro Sorotos (Shell UK) and Phil Lambeth (Mobil Oil Co Ltd).

Stage 2: Car refuelling emission control

Dr Wolfgang Wagner, BP Oil Europe

Vapour recovery (Stage 1a, 1b and 2) has become law in several European countries – Sweden, Switzerland, Austria and Germany. Other countries may follow in the near future as VOC reduction is part of the Rio de Janeiro agreement to reduce air pollution by 30 percent in the next few years.

Before Stage 2 vapour recovery implementation starts in the United Kingdom , it will be useful to consider the experiences already gained elsewhere. The following gives a short overview about the systems available at present, which systems are currently installed and where and how problems can occur in practice.

Types of systems

Two different types of systems are available:

- Active systems where the vapour is drawn from the vehicle by a mechanically created vacuum,
- Passive systems (balance system) where vapour is drawn back to tanks by natural vacuum created by the fuel pumped into the car.

Latest perceptions and experience with the efficiency and the substantial lower customer friendliness of balance systems with the typical unhandy nozzles have shown that active systems are more likely to be adopted in Europe.

Active systems have two types of basic operation: decentralised, where each hydraulic unit, or pump, or side of a pump is equipped with a separate vapour pump, and centralised with one vapour pump for all nozzles.

Some experiments and investigations with centralised systems have been carried out in Germany and Austria. This has shown them to be more expensive and that they have particular problems with vapour return flow regulation.

Decentralised systems are, at present, the common standard system in Europe. Sweden is fully equipped with Stage 2 vapour recovery systems, mainly with decentralised active systems (DAS). Switzerland started 1991 with passive systems but since 1993 most new installations are DAS. Austria and Germany also favour DAS systems.

For the full range of different pumps, two principal systems have been developed – mechanically and electronically regulated systems.

Installation

New pumps should be equipped with DAS systems by the supplier. For retrofitting, special kits can be delivered also by the pump supplier or other contractors.

There are a few things that should be taken into consideration when starting the installation of a vapour recovery (VR) system. Some of the problems caused by pump equipment can easily be avoided by checking and testing in advance.

A critical point is the space within the pump. It is essential to check each type of pump whether the particular VR equipment fits into the pump or not.

Another easy exercise is to check the electro motor in the existing pumps.

For most of the electronic regulated systems, the impulses from the pump controller are used for comparison and adjusting the vapour back flow rate. It may happen that because of additional connected card terminals or outdoor payment terminals, there is no free signal output available. It then depends on the type of VR electronics whether it can be connected parallel to already used in/outputs of the pump controller or a separate or additional electronic connection card must be installed.

Shortening the lengths of a coaxial hose is another item which has created some difficulties. Different extension factor for the inner and the outer pipes make cutting and refitting coax hoses very problematical. In case of a failed connection of the inner pipe, product can pass the vapour return way in the nozzle and the flow cannot be switched off.

Product flow rate on the nozzle is another issues for discussion. In the past it was intended to have product flow rate as high as possible. Smaller diameters on lead-free filling necks and VR nozzles do not allow high product flow rates. Practical experiences have shown that 38 1/min is typical.

Hose retraction systems can also give some surprise. The diameter of the hoses varies between 26 mm for a normal hose, 31 to 32 mm for a coax hose and 45 mm for a balance hose. That, and the fact that the space within the pump is already reduced because of the retrofit set, may cause some problems.

Vapour return lines

There are mainly two different systems developed and tested:

- Pipe in pipe system: Small, flexible plastic pipe inside the normal suction line, transporting the vapour back to tank.

This is the most cost-effective solution for retrofits and can be carried out without any groundwork and site closure.

- Separate vapour line: separate installed vapour return line, manifolded to tank.

Separate vapour lines are cost-effective, when installed as part of groundwork on the forecourt or at new and raze and rebuilds.

Conclusion

Many of the implementation problems have been experienced in other European countries, which can be used as a springboard for UK implementation of Stage 2. There is a wide range of approved and in practice tested solution for Stage 2 equipment and installation available. Decentralised active systems are more likely to be the common standard system in Europe. Electronically controlled systems are preferred because of their easy handling and their dry test capability. Pipe-in-pipe is the most cost-effective solution for vapour return pipe installation.

Yes, it can be done, but it isn't as simple as it looks.

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Reinventing the US oil and gas patch

By P S Adam

The US Department of Energy's Gas and Oil Initiative contains few surprises. Originally entitled the Oil and Gas initiative, the plan includes an assortment of tax incentives, research and development subsidies and regulatory relief measures aimed at multiple and interconnected policy objectives. These are: reducing the rate of increase in dependence on foreign (Middle East) crude oil, accelerating development of gas reserves, revising the domestic hydrocarbons industry – thus creating jobs, and making the US energy sector more environmentally benign.

The plan hopes to achieve a diversification of sources of supply in the medium term – and diversification away from oil in the long term. It reflects a shift, evident both in the United States and elsewhere, away from oil to gas as the hydrocarbon of choice – for the future.

First announced by Secretary of Energy Hazel O'Leary before the Louisiana State Legislature last April, this plan represents the first major effort to come out of the DOE, since the advent of the new administration, that deals principally with energy per se – as opposed to energy as an adjunct of US fiscal and environmental policy. The initiative is the result of a major collaborative effort between DOE, the Department of the Interior and the Environmental Protection Agency and various industry groups. Its final draft, recently made public, offers scaled-back versions of ambitious provisions included in initial working documents which had been circulating throughout the various government agencies concerned with the effort in recent months.

'The plan hopes to achieve a diversification of sources of supply in the medium term...'

Some of the original measures, which included coordination of government fuel expenditures to stabilise prices and imposition of a duty on imported crude, reveal how far at least some in the present administration would like to go in enlarging the scope of the federal government's activity in the energy sector. But the fact that the final plan is significantly less far-reaching than originally proposed demonstrates the extent to which the administration is also willing to compromise in order to seek consensus and approval.

The plan, in its final form, is long on governmental strategies, analyses and studies to be performed by various government groups. At the same time, it is short on real assistance to the nation's oil and gas producers. Also it does seem to skirt some major issues, i.e. what exactly to do about increasing US dependence on Middle East crude supply. The initiative opts instead for further studies to be done on this matter by the DOE in conjunction with the National Security Council and the newly-formed Economic Security Council. Although energy security has been reviewed many times by various government agencies, to little apparent avail, there is, in all fairness, justification for another thorough consideration at this point. In light of the collapse of communism in the Soviet Union, the end of the cold war and, more recently, the signing of the Middle East Peace Agreement which has established, at long last, a Palestinian state, the subject does warrant re-examination.

Overarching goals

The initiative's orientation is decidedly high-tech, environmentally friendly, pro-active and pro-gas and anti-drilling in ANWR. It sets forth as its two overarching objectives: creation of high-technology jobs and reduction of the trend towards high oil imports. The three principal lines of attack (called elements in the initiative's text) include increasing domestic gas and oil production (and environmental protection), stimulating markets for natural gas, and improving communication and decision-making as they pertain to the government's role in the domestic hydrocarbon patch.

Increasing production

In order to increase domestic oil production, the plan calls for boosting advanced oil recovery capabilities and reducing the rate of reservoir abandonment – to be accomplished through active promotion of advanced E&P techniques.

The plan proposes an 'industry driven' Advanced Computation Technology Initiative to enhance joint government/industry/university research, development and deployment efforts of advanced computing problems related to E&P. Such an effort will be associated with conversion of defense capabilities to peace-time application. The initiative calls on national defense labs to participate in modelling subsurface conditions for gas and oil projects. Total federal commitment will be $50 million towards these programmes 'in addition to substantial funds from private enterprises.'

Costs of environmental objectives

To help gas and oil producers reduce the costs of meeting the administration's environmental objectives, the plan calls for the establishment of an industry-focused environmental research advisory board which will include representatives from DOE, Office of Environmental Policy, Office of Science and Technology Policy and the Department of the Interior. The purpose of the board will be to advise the government on energy-related R&D. It will also create an environmental technology demonstration and technical assistance programme which will develop specific studies and demonstrations, such as an examination of the feasibility of significantly increasing the amount of lubricating oil that is recycled and exploring the Federal government role in oil spill clean-up research and development.

The plan proposes also to stimulate development of a nationwide technology transfer network and assistance programmes. This is held to be especially important in encouraging the 8,000 independent gas and oil operators to adopt innovative exploration and production methods.

No one claims that all this won't be expensive, though, particularly for smaller independents who will have to pay for it – and especially if oil prices remain low. In light of this, the plan

explains that the DOE and the Treasury are examining legislation that would permit domestic companies utilising these techniques to expense rather than amortise geological and geophysical outlays.

Stimulating markets for natural gas

With respect to government efforts which will increase natural gas's share of the demand pie, the new administration plans to step on the accelerator. The plan outlines two coordinated programmes to speed up the use of natural gas in transportation markets: The Federal Fleet Conversion Task Force, designed to convert public and private fleets to alternative fuels and coordinate efforts leading to alternative fuel refuelling infrastructure development; and The Clean Cities Programme – an effort to coordinate state and local public and private alternative fuel vehicle market development.

In order to stimulate both automotive as well as other markets for natural gas, the plan calls for streamlining administrative procedures, facilitating investment in infrastructure, and use of advanced technologies in storage and distribution. And the plan calls for agencies involved to make sure that good, efficient government prevails, proposing establishment of an interagency working group with the Federal Energy Regulatory Commission which will meet on an ongoing basis to coordinate policy efforts with DOE.

Information, monitoring and analysis

The plan also calls for increased support of industry efforts aimed at improving capabilities for monitoring and modelling natural gas availability and flows and matching storage to end-user requirements – particularly in the area of electric power generation.

In order to facilitate a more efficient, competitive gas market, the plan calls on DOE to improve its ability to develop, collect and disseminate information on natural gas deliverability and storage. To do this it will rely upon an expanded Energy Information Administration to collect data and develop an Energy and Resources Mapping and Information System.

Frontier areas

While declaring the Arctic Natural Wildlife Area of Alaska still off limits, the initiative allows that access to frontier areas should be considered on a regional basis. To do this Federal Lands Energy Coordinating Groups are being established to draw up memoranda of understanding between various departments: Energy, Interior, Agriculture Forest Service.

To address the problem of declining Alaskan North Slope production, which means the West Coast will once again be a significant importer by 2000, the initiative proposes removing many of the barriers that inhibit development of California resources: restriction of pipeline access for non-integrated producers and developing strategies to permit California refineries to process greater proportions of heavy indigenous crudes.

Energy security

The Initiative concludes with a section entitled 'The Impacts of Oil Import Dependence'. With respect to energy security, it skirts the issue calling for an interagency committee lead by DOE including the National Economic Council and National Security Council, to assess the economic, security and environmental implications of rising US oil import dependence – putting off, perhaps wisely, any serious discussion of the issue for the present time. The matter does require, at this time, a thorough re-examination.

Gas, the future and Middle East oil

The plan recognises the fact that the United States, along with the rest of the world, is becoming a gassier place. Those who have written the plan have caught sight of a brighter gas-lit, energy secure future. Understandably given the administration's environmental thrust, they are smitten. The foul reality, however, is, as the plan obliquely acknowledges, that both the world and the United States will depend on oil-based motor fuels for the foreseeable future. And that the efficiency of the US energy sector will continue to be as bound up as ever with the petropolitics of the Middle East, no amount of high tech domestic E&P wizardry and state-of-the-art electronic information computer network highways or stimulation of gas demand will really change this in a meaningful way – either during the Clinton administration(s) or even over a contiguous Clinton/Gore era.

'...the United States, along with the rest of the world, is becoming a gassier place'

Moreover, success of the new administration's economic policies and social policies, which include deficit reduction with increased social spending, is dependent on continued low interest rates and low inflation to keep federal government interest outlays from growing. These in turn are dependent on low oil prices which are, and will most likely remain, under the influence of the major producers of the Middle East. Should something happen there that goes beyond the capability of the administration to use the SPR and the Rapid Deployment Force to mitigate, it could well encounter the same sorts of difficulties that plagued the Carter administration. It would be well to keep in mind also that the spike in oil prices before the battles of Desert Storm contributed to recessionary tendencies in the US economy which helped preclude George Bush from winning a second term.

So far these new policy-makers, like those they replaced, have envisioned the promised land of gas; initiative or no initiative, however, they are not going to be out of the wilderness for quite a while yet – not by a long shot.

Which is not to say the plan is without merit.

The Gas and Oil Initiative, in its final incarnation, is consistent with the platform on which Democrat William J Clinton ran for office and with his campaign pronouncements with regard to energy. The plan is also consistent with, and subordinate to, the economic and environmental goals which have, so far, determined his administration's policies, reflecting the moderate, centrist approach it has taken on most issues.

Furthermore, inherent in a switch-over to gas is a mandate for change in political attitudes regarding the government's role in the economy. Industrial policy or industrial planning as it pertains to the development of gas reserves is a function not so much of political orientation but of the realities of the daunting upfront capital costs which will be necessary in a gassier world. Those Democrats presently determining energy policy seem far less reluctant for the government to take the lead in this and other areas that pertain to becoming actively involved in the economy than their predecessors in office. In the realm of energy this can be seen as a strength.

The initiative responds to the significant changes which have taken place in the United States and international energy sector since the last Democrat, Jimmy Carter, left the White House. It is also in line with a consensus which seems, in the interim, to have formed in the United States, among intellectual elites, the political community and the electorate at large, with respect to oil and gas and the place of each in the US energy mix – at least for now.

Time alone will tell if the Department of Energy will play a significant part in reinvigorating the US economy generally and the extent to which plans like this can contribute to doing so through establishing a more efficient oil and gas sector. Despite all the plan's strengths, however, for the foreseeable future at least, the Gulf producers will still have the last word. Any future surprises impacting the US oil and gas patch may well emanate not from DOE's carefully wrought plans, but from the Gulf.

Opening up the oil industry: how far will China go?

By Paul McDonald, Managing Director, Pearl Oil Ltd

The People's Republic of China, one of the Asia/Pacific region's few net oil exporters, is about to become a net importer. The world's most populous country is growing so quickly that it can no longer produce enough oil to supply its own needs. This is an important development for a country that has tried for most of its history to remain independent of the outside world. Oil, in particular, has been viewed as a strategic raw material and has remained largely in the hands of the state.

This situation could change, however, as China becomes a net importer of oil. Private, international companies could greatly expand their role there, not only as suppliers of oil, but also as providers of capital, technology and expertise. The effect of this might be to produce a more outward-looking Chinese oil industry, which might in turn move overseas itself, providing the Chinese with international oil companies of their own.

Deregulation

The extent to which China does develop an international oil industry of its own depends largely on how far the government is prepared to go in deregulating the oil sector inside China. Private companies are already allowed in many areas of the oil business, both upstream and downstream, but the state sector remains the dominant player in nearly all sectors of the industry.

Further deregulation and privatisation are planned but Peking may stop short of allowing the full decontrol of the oil industry. The further opening-up of the industry to private and foreign investment could even be met with calls in some quarters for the reimposition of controls in order to prevent the oil industry from falling under foreign domination.

The process of deregulation stems largely from the economic reforms introduced in the agricultural and industrial sectors during the late 1970s, which became known as the `Open Door Policy'. Under this, economic control was gradually decentralised and private capital was given an important and growing role in the economy.

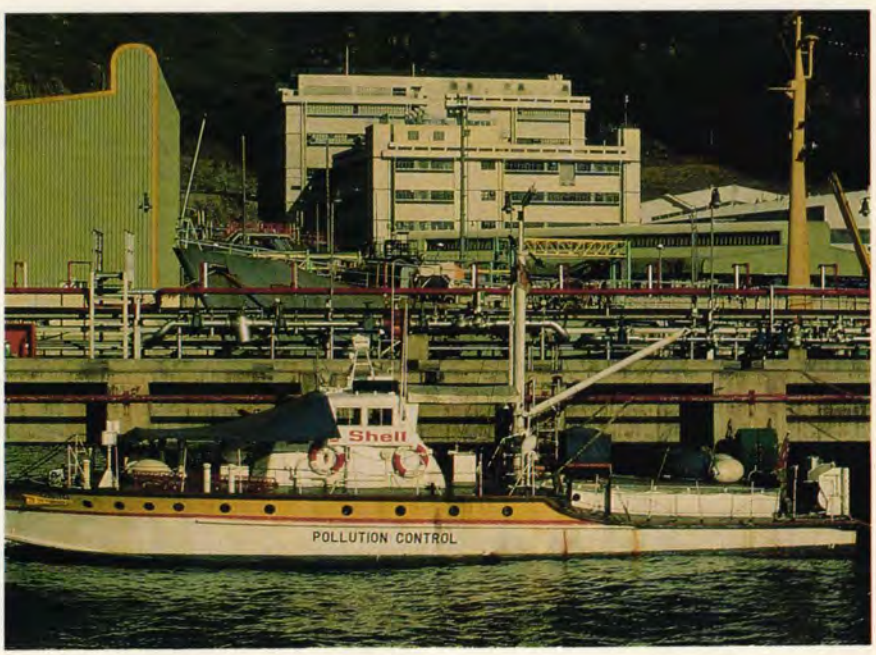
This was not the first time that China had opened its oil sector to private companies. On previous occasions, however, economic reforms were halted: often because they were alleged to threaten the country's energy security.

For most of their history, the Chinese have been uncomfortable with the notion of relying on outsiders for the supply of staple commodities. For centuries, foreigners wanting to trade with China received a similar message to that given to George III's envoy, Lord Macartney from the emperor, Ch'ien Lung: 'Our Celestial Empire possesses all things in prolific abundance and lacks no product within its borders'. Notwithstanding the Open Door Policy, the notion of national self-sufficiency continues to have considerable support in the present government, especially for key raw materials.

Early oil industry

Despite this, oil has been imported into China for more than 100 years. During the latter half of the 19th century, mass production of the kerosine lamp created a market for a fuel that was virtually non-existent in China. Mobil was supplying lamp oil as early as 1880 and Royal Dutch began exporting its 'Crown Oil' kerosine in 1894.

Mobil was able to develop an extensive trade by the clever strategy of marketing kerosine lamps, which then created a market for its oil. The lamp was known in Chinese as 'Mei Foo' and this became the name under which Mobil Oil itself was usually known. In



Anti pollution vessel at Tsing Yi

Shell products on display in Shanghai

1894, the corporation set up an office in Shanghai.

Shanghai subsequently housed the offices of other American oil companies, along with Shell, but foreign oil imports declined after World War II and the establishment of the People's Republic in 1949. During the 1960s, oil production from Chinese fields, such as Daqing, now the country's largest, began to increase. At the same time, government policy turned back towards economic self-sufficiency. In 1966, Shell closed its Shanghai office and more or less ceased to trade with China except for a few specialist products, which were mainly chemicals.

Companies return

In the early 1970s, foreign companies began to return. Mobil, for example, became in 1974 the first overseas firm to buy gasoil and jet fuel from China as the country began to export small quantities of refined products. Shell stepped up its trade in chemicals and re-established itself in China by opening a representative office in 1980 in Peking, followed later by one in Shanghai.

Since then foreign companies have entered the retail sector and begun to establish distribution networks inside the People's Republic. They have also been admitted to the upstream sector, though initially, they were only allowed to explore offshore. Now, however, the onshore sector, which accounts for most of the country's reserves and production, is also being liberalised. The first onshore tract to be explored was a 20,000 acre block on Hainan Island in the South China Sea which was awarded to a US independent called Myung & Associates, in 1990. Since then, other larger and more prospective areas have slowly been opened up, culminating in 1993 in the Tarim Basin, in western China, which the Chinese say may contain up to 74 billion barrels of oil: though little exploration has actually taken place so far.

The main issue now for China is how far it should go on liberalising the upstream and downstream sectors. Some government officials believe the process is proceeding too quickly, threatening the government's control of the economy. In particular, there is a feeling in some circles that loss of economic control will be quickly followed by a loss of political control by Peking. The search has therefore begun for a policy that will allow China to meet its growing needs for oil without jeopardizing energy security.

The key to this search may well lie to a considerable extent in Hong Kong. The British colony provides not only a route for trade (including oil) and capital but also an example of successful economic growth, and one that is being imitated in many parts of China, especially in the south.

Hong Kong provides a base from which western oil companies such as Shell, Mobil and Caltex supply their marketing and distribution operations in southern China. The island of Tsing Yi contains distribution depots operated by these companies, along with Esso and China Resources, from which they can supply the mainland along with the nearby Portuguese enclave of Macau.

Hong Kong's own market is probably close to saturation, especially now the government's Environmental Protection Department is discouraging the use of fuel oil by the manufacturing industry and promoting electricity as a means of powering motor vehicles. China, on the other hand, is a rapidly growing market, especially in the neighbouring province of Canton, which contains some of China's fastest growing areas, including the Special Economic Zone (SEZ) of Shenzhen, immediately adjacent to Hong Kong.

SEZs are generally the most dynamic parts of China economically, thanks to the official encouragement of private industry there. This makes them attractive to foreign firms. Shell, for example, has service stations in Shenzhen plus two joint venture depots at Shekou and Chiwan. Elsewhere in Canton, Shell is studying the feasibility of a 160,000 b/d

Shell service station, near Beijing

joint venture refinery at Donglian, a distribution network for liquefied petroleum gas and an import terminal for liquefied natural gas.

Several other large foreign oil investments are under study in other parts of China, including a 100,000 b/d refinery planned by Total at Dalian in northern China and a 160,000 b/d unit at Pudong, next to Shanghai, in which Elf Aquitaine is involved.

Canton province continues to attract most outside attention, however, with proposals for refineries in several places. Amoco and Agip, for example, have held talks with the Maoming Petroleum Chemical Company about a 100,000 b/d joint venture refinery at Tianbai, near to the existing 170,000 b/d Maoming refinery. South Korea's Yukong is interested in building a 60,000 b/d plant at Shenzhen and the Chinese are trying to interest oil exporting countries such as Saudi Arabia and Iran in joint refinery ventures.

The growth of China's domestic oil market is even attracting companies from outside the oil sector. A Hong Kong property company, Parkview, wants to build a 220,000 b/d refinery in Guangxi, to the north of Canton, and several of the colony's firms are already involved in the oil trade with China.

Foreign expansion

The opening-up of the Chinese market in this way has also produced a move in the opposite direction whereby companies from the mainland are investing in Hong Kong's oil sector. China Resources, for example, has service stations and a products distribution network in the colony and various Chinese firms now have international trading operations there, including state oil companies Sinochem and Sinopec.

Some of China's large state corporations are now extending their sights well beyond Hong Kong. Trading company Sinochem is already involved in a refinery joint venture in California where it operates the 52,000 b/d Hercules refinery in conjunction with Coastal Corporation. It is also establishing joint trading operations with other Chinese state oil companies, including Unipec with refiner Sinopec, and Sinoil with the China National Petroleum Corporation (CNPC), the country's main crude oil producer. The link with CNPC may eventually involve Sinochem in more than just trading: it could also become a vehicle for Sinochem to move into upstream ventures overseas, thus breaking down the present division of the state oil sector into largely specialist upstream and downstream companies.

Sinopec, which runs most of the country's refineries is also expanding. Apart from its Unipec venture with Sinochem, it is investing in refinery joint ventures in China, such as the Shell venture in Canton. It, too, may seek upstream and downstream ventures overseas, including refinery joint ventures located outside China.

CNPC also wants to expand beyond its original remit to run China's onshore oil production. It has already begun to sell its expertise abroad. In Peru it is trying to raise the output of a small oilfield, from about 1,000 b/d to 2,000 b/d, as well as identifying new reserves for future exploration. Further exploration is planned in Canada, Papua New Guinea and Thailand. Officials in the company say that its eventual aim is to become a 'world leader' in exploration and development.

Overseas moves by China's national oil companies are likely to increase in future as the government continues to privatise and deregulate the industry at home. As the major state corporations lose their previous monopoly privileges, foreign expansion is seen as increasingly necessary if they are to go on expanding their operations.

In order to do this, though, these companies must restructure themselves and change from being large state corporations into much more commercially orientated companies. For this to happen, there will have to be further changes in the oil industry inside China.

So far, the government is indicating generally that it is willing to see further liberalisation of the oil sector; but some voices are being raised against both the speed and the scope of future changes. Such voices often reflect the historic Chinese problem of sharing economic power and the revenues from taxation between the centre and the regions. Many in Peking believe that the balance has recently become tilted too much in favour of the regions, especially those in the south.

There are now calls for a more 'managed approach' to economic and industrial policy. Japan's system of government supervision by large central ministries is often cited as a model for China to follow. This approach, however, is coming under attack in Japan, where it is criticised as being too bureaucratic and resulting in the stifling of new business initiatives. Prime Minister Morihiro Hosokawa may soon try to reduce Tokyo's control over business and further liberalise the heavily controlled oil industry, in particular.

For the moment, this leaves China pursuing an increasingly laissez-faire approach to the oil industry, leading to more privatisation and foreign investment, especially by enterprises located in Hong Kong. This has proved particularly advantageous for the province of Canton and many other regions are now trying to pursue similar policies of attracting private capital in order to catch up with the booming south.

Increasing diversity

This is expected to bring in investment from foreign oil companies for new refining and production ventures. Future oil investments will not necessarily be confined to established oil firms. Many Hong Kong companies with little or no experience in energy are now discussing oil trading, distribution and refining activities on the mainland. Overseas, Chinese in South East Asia, Taiwan and elsewhere are also seeking a share of China's expanding oil market. The future pattern for the country's oil industry could therefore be one of great diversity at home combined with a growing international presence for the formerly purely domestic state oil sector.

CHINA – OIL BALANCE 1993

	('000 b/d)		('000 b/d)
Production		***Exports***	
Onshore	2,800	Crude	370
Offshore	90	Products	75
Total	**2,890**	**Total**	**445**
Consumption			
Naphtha	190		
Motor gasoline	700		
Jet kerosene	90		
Gas oil	785	***Imports***	
Fuel oil	575	Crude	180
Others (including stocks)	555	Products	270
Total	**2,895**	**Total**	**450**

Source: Pearl Oil, based on Chinese press reports.

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USED LUBE OIL DISPOSAL

SHOULD WE RE-REFINE IT? - OR BURN IT? – OR WHAT?

10 March 1994

The Cavendish Conference Centre, London

The worldwide lube oil demand is approximately 1 percent of the barrel, i.e. around 30 million tonnes per annum. Only a fraction of the lube oil fed into most applications is actually consumed - the balance eventually deteriorates in service and has to be renewed. The quantity of used oil thus generated worldwide is considered to be around 20 million tonnes per annum.

Figures concerning the dispositions of this used oil vary widely from country to country. In the USA in 1988, only 2 percent of used oil was recycled back to virgin oil quality; 58 percent was burned as fuel. A large amount was dumped in land fills or down the drain to sewerage systems, creating environmental problems. The easily grasped and staggering comparison is that "more used oil is illegally disposed of or dumped in the United States each year than the sum total of 'more than 35 *Exxon Valdez* crude oil spills of Alaska in 1989'.

How long can we let this sort of thing go on? Shouldn't enlightened governments all over the world provide incentives (like some do now) to make used oil collection and recycling, or other proper disposal, a worthwhile environmental clean-up effort? After all, we justify the spending of enormous sums to avoid atmospheric and water pollution from other industrial activities.

Our conference will enlarge on the above themes with speakers on the following topics:

- **Overview** - the magnitude of the worldwide problem - attitudes of different countries towards remedial measures.
- **Used oil management** - the control of a system that can be wide open to malpractices.
- **Update on re-refining technology**, including ultra-high vacuum thin film distillation, and hydrogenation.
- **Experiences of a successful re-refiner in California**.
- **Technology of alternative disposal options**
  a) burning - the big current outlet
  b) gasification - combined with waste tyre disposal - environmentally perfect?
- **Recycling used lube oil into the quality automotive market** - views of an independent lubricant company.

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

New legal framework for coalbed methane?

By Geoffrey Mayhew

The inclusion in the Queen's Speech on 18 November last year of the words 'Legislation will be introduced to privatise British Coal' was the hoped-for signal that should lead on to the establishment soon of a new energy industry in the United Kingdom: the production and supply of onshore coalbed methane direct to industry.

'The whole industry will welcome this news,' said Mr Malcolm Butler, Chairman of the United Kingdom Onshore Operators Group (UKOOG). 'We have the opportunity to lead Europe in establishing a successful coalbed methane industry, similar to that flourishing in the United States.

'This will encourage the development of new technology and cost reduction techniques, which should also benefit the conventional oil and gas industry, and lead to export opportunities for equipment and expertise developed here.'

During the past three years a number of companies have become interested in drilling into coal seams in order to extract methane.

Under the Petroleum (Production) Act, 1934 Coalbed methane is petroleum and since 1991, when this interest in the gas began to grow with the coincident arrival of would-be explorers from the United States, the Department of Trade and Industry has issued 34 licences. Little drilling has taken place, however, and hardly any coalbed methane is used commercially.

This onshore development would have happened by now but for difficulties of a kind that only parliamentary legislation can resolve.

Proposals for Parliament's approval in the Coal Industry Bill, which was presented and published on 3 December last year, are intended to clear up those difficulties.

The Bill gives details of an extra licensing arrangement for the exploitation of coalbed methane from coal seams, which it describes as desirable. Coalbed methane is reaffirmed as a property of the Crown.

Clause 9 seeks to establish that the Coal Authority, a new regulatory body which will carry out the privatisation of the coal industry, should also, with the approval of the Secretary of State, give licences for coalbed methane exploitation to drillers who have already obtained a licence from the Department of Energy under the Petroleum (Production) Act, 1934.

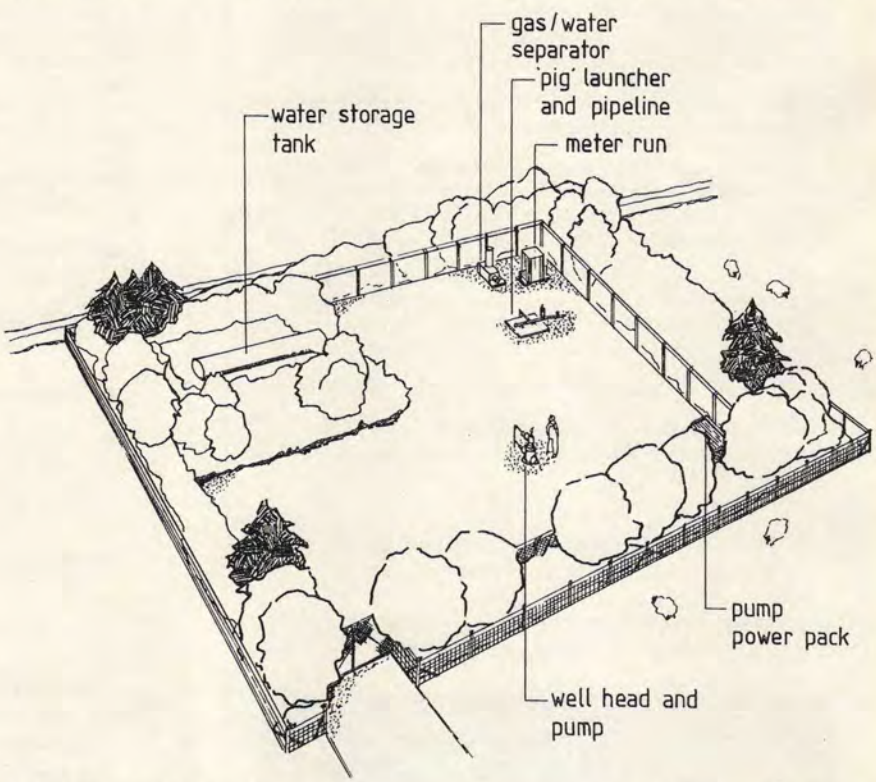
The explorer would pay only one fee, for the first licence, but the Coal Authority may be allowed to charge its administrative cost.

The coalbed methane industry is also new in the United States, where it began in 1985. Daily production now accounts for some three percent of US gas production. It was the success of this industry that sparked off coalbed methane interest in the United Kingdom.

In the United States a new science, the evaluation of coalbed methane reservoirs, has developed, based on the techniques of petroleum.

It is understood that the government hopes that the provisions of the Coal Industry Bill, including those for coalbed methane exploitation, will be law by this Summer.

People within the coalbed methane industry are hoping that some rapid progress in drilling will be possible this



Proposed gas production site **Source: Evergreen Resources**

year. One intending coalbed methane producer in the United Kingdom is Kinetica, a company jointly owned by Conoco and PowerGen. It believes that by 2000 a significant percentage of all gas used in the United Kingdom will be coalbed methane.

Mr Tim Eggar, Energy Minister, said as long ago as 1992 that, 'if it (coalbed methane) can be successfully exploited here it could represent a very valuable addition to our future energy supplies.'

Various estimates have been made about how much coalbed methane can be extracted onshore with current technology. These range between 6 and 11 trillion cubic feet. In comparison, the remaining offshore proven and probable reserves of offshore gas are estimated to be some 55 trillion cubic feet.

'Sold by the therm, it will be highly competitive with British Gas'

Mr Ian Thomson is vice chairman of UKOOG and Managing Director of Evergreen Resources (UK) Ltd, which has drilled a coalbed methane well in Cheshire, Sealand 1, near Chester, which is on long-term test, and a second well in North Wales.

He said, 'Operators plan to drill about 15 coalbed methane wells in 1994. The Bill will be good news for industries near coal measures, which are eager to buy our gas.'

Hillfarm Coal Co Ltd is currently completing its first coalbed methane well outside Falkirk, Scotland.

The reason why this embryo industry has been waiting for Parliament to act is that all coal, whether economically workable or not, belongs to British Coal. After a company has obtained its licence from the Department of Trade and Industry under the 1934 Petroleum Act, it has to turn to British Coal for permission to enter coal seams.

In earlier days when onshore oil explorers applied to drill through coal seams in search of oil, British Coal gave permission, subject to technical conditions and the supply of geological data.

When it became apparent that the methane in and around the coal could be a desirable source, British Coal asked for an element of operational control, greater access to data and demanded rents which would-be operators considered to be too high. 'The annual payments became related to a formula based on the tonnage of coal calculated within an area of each well,' explained Mr Henry Boyd, of Oil Management Services, which represents the onshore oil and gas industry, including the coalbed methane industry. 'Part of the problem appeared to be a reluctance on the part of British Coal to accept that natural gas within and around coal seams is the property of the Crown, and can be licensed by the DTI.

'This position conflicted with the role of the DTI in its award of licences under the 1934 Petroleum Act. The payments were also directly contrary to the current practice in the UK where, other than the Crown, the owner of land or other mineral resources does not benefit from the production of Crown minerals such as oil and gas.

'Operators formed the opinion they should not pay British Coal for gas which the Crown owns, or for permitting the exercise of rights under a DTI licence. In obtaining a petroleum licence to search for coalbed methane, the licensees had already committed themselves to pay fees and to invest in operations in the licenced area.'

A further twist which has prohibited the development of coalbed methane as an energy source separate from coal is that the 1947 Act which created the nationalised industry did not allow it to produce methane commercially.

Licensees could have tested British Coal's policy in the courts earlier but they knew of the government's intentions to privatise coal and therefore waited. In the meantime, lobbying has taken place to inform MPs, civil servants and others of the technical and financial parameters necessary for the establishment of a viable industry.

High investment

Mr Ken Carson, Business Development Manager, Kinetica, said:

'Coalbed methane production will require high investment. Typically, a field with a minimum of 20 wells will be required in order to provide the necessary long-term confidence for investors and customers.

UK COALBED METHANE

In the United Kingdom the most extensive source of coalbed methane is humic coal. There is a good deal of existing information to show where it is. British Coal and the British Geological Survey have data which is commercially available. Ranking humic coal in carbon content, the lowest is peat and the highest anthracite. As the ranking rises more gas is generated per ton of coal, of which about 95 percent is methane. The other components are nitrogen and carbon dioxide.

Most of the gas escapes from the coalbed and is adsorbed onto the surface of micropores in the coal and held there by pressure in a monomolecular layer. The remainder is found in fractures and dissolved in water.

Coal has an internal surface area of approximately one billion square feet per ton, and substantial quantities of methane can be stored. A gas content of 700 cubic feet ton of coal has been reportedly measured in the South Wales coalfield. The first act after drilling is to remove that water in order to lower the hydrostatic pressure. This causes a desorption which causes the methane to move gradually towards the bore-hole.

Desorption, by reducing the reservoir pressure, controls the production of methane and it is achieved by pumps which remove the accumulated water from the system at the desired flow rate. The dewatering period may take weeks, or years.

There are three states in the flow of methane through a reservoir: desorption from the internal surface, diffusion on a molecular level through coal micropores and the matrix, and through the cleat and fracture system. In the process a great deal of water is usually produced which, if saline, as is expected to be the case in the United Kingdom, has to be removed to make it harmless to the environment.

'Sold by the therm, it will be highly competitive with British Gas'

'Initial exploration will take place at what is expected to be the core of the field. That first well would cost some £700,000 to £800,000. A pilot development would follow, hopefully, with four or five wells coming on stream. The commercial development would comprise at least 20 wells as the production moved away from the core. An operation with a minimum of 20 wells and with a pipeline to deliver to the customer would cost over £10 million.

'The delivery would, where possible, be direct to the industrial customer, and he will be in the areas of the coal mining industry where new industries are being established. Long-term contracts, for example for 30 years, will be our objective.

'This type of gas may have a lower calorific value and a lower pressure than North Sea gas. British Gas is reluctant to accept it into their transportation system without enrichment. But that may not be important in the type of business coalbed methane will attract. Sold by the therm, it will be highly competitive with British Gas.

'At present Kinetica is the only coalbed methane licensee which also supplies gas from the North Sea. That puts in a useful position as we shall be able to offer a customer the certainty of a back-up if there is an interruption in coalbed methane supply.'

In the 6th Onshore Round in January 1993 Kinetica was given two licences for coalbed methane exploration and production. One is in an industrial area west of Stafford and Stoke-on-Trent. The second is in Humberside, east of York. Because of the unresolved situation with British Coal, no drilling has yet taken place.

'The Stoke-on-Trent licence covers 600 square kilometres and comprises six blocks, our fee to the DTI being £1,500 per square kilometres,' said Mr Carson. 'British Coal wanted a rent of £8,000 to £10,000 a year for each well, which would have made the operation unprofitable.

'We have not yet talked to customers but we have a work programme and a budget that will be spent once the access problems are resolved.'

Mr Carson described a typical coalbed methane supplier of the future. 'Low-cost, low-overhead companies will be the operators in this new industry,' he said. 'It will not be a high profit business

'However, within 10 years the UK should be in a position not unlike that of the United States where coalbed methane accounts for 17 percent of the prospective gas recovery. We think that 10 percent of Kinetica's gas supplies could comprise coalbed methane in 2000.'

UK developments

Kinetica has introduced a US specialist partner, Taurus of Alabama, into their licensing agreements, with a four percent share. Taurus is one of the coalbed methane producers in the Black Warrior Basin, New Mexico, which, with the San Juan Basin, is a key US producing area. The geology in Black Warrior is similar to that in the UK coalfields. Taurus is working on geological investigations for Kinetica. More than 7,000 wells have been drilled for coalbed methane in the United States.

'We are confident that the coalbed methane industry will develop'

Drilling for coalbed methane is by methods used in the oil and gas industry. Near Falkirk, the Hill Farm Coal Company used a wireline to retrieve cores from two wells. These were extracted quickly and the wells were kept under pressure. The rapid retrieval enabled them to study the cores before desorption of water had taken place. They say this has enabled them to form a good judgement of what they have discovered.

Another US company , Cawley, Gillespie & Associates Incorporated, of Fort Worth, Texas, has developed the technology of evaluating coalbed methane reservoirs. From a base in London, they are now going to study coalbed methane reservoirs in the United Kingdom, Europe and southern Russia.

'The evaluation of a coalbed methane field is a matter about which great care has to be taken,' said Mr J Craig Creel, Executive Vice President. 'Pressure coring does provide the highest degree of certain information, but it is the answer only for that well. The result from another well only a short distance off may be less attractive commercially.

'Because of that development mistakes of a bandwagon type happened in the United States early on. It was believed that one good well would be followed by many similar ones. Then a 'sweetbox' situation was discovered. Good wells are found within the 'sweetbox', but just outside it there is nothing of commercial value. The further away will be another 'sweetbox'.

'As an example of variation, in one good area of the United States the average is two good wells per square mile, while in another good area the average is eight. We believe there will be large variations in the commercial value of finds in the United Kingdom, moving, perhaps between extremes.

'Nevertheless, a very large exploration area has been made available in the United Kingdom. I would expect that if all the concessions were taken up, there would be some 2,000 coalbed methane wells in production, over time.

'I think the nature of the companies involved will cause this development to happen gradually. On finding a successful well the independent company, which will not survive unless it is cost effective, will wish to monitor production for three to 12 months before it goes forward with other wells. I estimated that five years will be required before the full production of a field is reached.'

An Evergreen Resources coalbed methane wellhead

Current licences

Evergreen Resources has the largest net coalbed methane acreage with 2,536 square kilometres in Wales, Northern England and West Midlands – eight licences.

Eastern Generation, a wholly-owned subsidiary of Eastern Electricity, has five onshore licences for coalbed methane exploration covering 1,204 square kilometres. These are in the Midlands, the northwest, east of Perth, east of Leeds and Kent.

While their approach to the economics of the new industry is cautious, they expect a return above the cost of operation. Their hope is that the intentions of the Bill will encourage British Coal to negotiate better terms with methane operators, thus allowing work to begin next year.

As coalbeds are comparatively shallow in the United Kingdom and near to centres of consumption, while gas prices are higher than in the United States, the economics could be attractive to explorers who find large fields.

IP THE INSTITUTE OF PETROLEUM

London Branch

'Virtual Reality – Its Potential for Business Application'

By Mr A Tait and Mr M Thornton,
Dimension International

at the Institute, 6.00 pm, Tuesday 18 January 1994

A live demonstration of the application of desk-top virtual reality systems in the business field, starting with the modelling of simple objects, through to applications such as fire escape planning, telecommunications network management and architectural development. The audience will have opportunity for hands-on experience, including use of 'total immersion' sensory equipment.

Tea and biscuits will be served at 5.15 pm and the meeting is followed by light refreshments, kindly sponsored by Conoco Limited.

Enquiries: Mrs E Walker, Hon Secretary, London Branch Tel: (0926) 404257.

IP THE INSTITUTE OF PETROLEUM

Possible formation of an Information Technology Discussion Group

The Institute of Petroleum is considering the formation of an Information Technology Discussion Group, along the lines of other existing discussion groups. If it is finally decided to set up such a group, it is intended that the subject of IT would be looked at from all viewpoints – manufacturers and suppliers, user and operators. It would cover the use of IT in all sectors of the oil industry. The group would run evening meetings and occasional conferences.
In order to decide whether to go ahead, we would be grateful if any IP member who is interested would return the form below.

Proposed IT Discussion Group

I/my company is interested in the formation of an IT Discussion Group ☐

I would be prepared to serve on the organising committee ☐

Name: .....

Job title: .....

Company: .....

Address: .....

.....

.....

Tel: ..... **Fax:** .....

*Please return this form to **Catherine Cosgrove**, The Institute of Petroleum, 61 New Cavendish Street, London W1M 8AR.*

Monopolies and Mergers Commission Report into supply and transportation of gas

By IG Thomson, Consultant

The British gas industry is facing the prospect of further change and uncertainty. Following two referrals of British Gas (BG) to the Monopolies and Mergers Commission (MMC) in 1992 by Mr Michael Heseltine and Sir James McKinnon, the Director General of Gas Supply at Ofgas, the MMC is recommending to the government that amongst other measures to limit its dominance, BG will need to divest itself of its gas trading arm and to concentrate on gas transportation and storage. The government's imminent reaction is awaited with interest across the industry.

BG was privatised in 1986 as an integrated monopoly to sell and transport all gas in Britain. After 1986 it faced progressive regulatory pressure from the Office of Fair Trading (OFT) and the Office of Gas Supply (Ofgas). By 1988 a report on competition by the MMC forced BG to publish schedules of gas prices to contract customers. Producers were also obliged to sell no more than 90 percent of their gas to BG in an attempt to stimulate competition artificially. A programme whereby BG releases gas to independent suppliers was introduced shortly afterwards.

In 1991, the OFT concluded that competition was not developing satisfactorily. It felt that only 5 percent of the traditional contract market would be released from BG by 1991 and the share would actually fall by 1995. It also took the view that the steps taken to open up the onshore transportation system were inadequate. BG subsequently undertook to operate transportation and storage as a separate unit. In 1991/92, a new tariff formula was introduced (RPI minus 5 percent) in the domestic gas market and, afterwards, BG's monopoly threshold was reduced from 25,000 therms a year to 2,500 therms a year. In 1992, Ofgas referred BG to the MMC under the Gas Act 1986 and the DTI referred BG under the Fair Trading Act. BG welcomed the referrals as they felt that there was a degree of unfairness in the way they were being treated and they wanted to widen the review to include the whole of BG and the gas market in Britain.

1993 MMC Report

The MMC found that the dual role of BG as a seller and transporter of gas might be 'expected to reduce the effectiveness of competition in supply of gas ... inhibiting choice, restricting innovation and leading to higher levels of gas prices' and was therefore 'against the public interest'. It found, however, that BG's monopoly in the tariff market was not against the public interest.

The MMC recommendations to the government are:

- The divestment of BG trading activities by the end of March 1997. This would commence in April this year when BG's gas transportation and storage activities will be transferred into a separate unit.
- BG should have its monopoly reduced in March 1997 to include only gas customers using less than 1,500 therms – this will add a further 500,000 customers to the competitive market, including 100,000 industrial and commercial customers. The entire monopoly will be removed three to five years later.
- The rate of return BG is allowed to earn from charging competitors for use of its pipelines is to be set at 6.5-7.5 percent on new investment under current conditions. This is equivalent to between 4-4.5 percent on existing, current cost assets.
- Altering its price cap formula for household customers to 4 percent below the rate of inflation from the current 5 percent.

The report considered that the regulatory regime was 'sound' (against which criteria is not universally clear) and that there was no case for a major increase in prices and profits as BG wanted.

Regulator's position

The Regulator throughout has seen his role as that of protecting and promoting the interests of his customers and as a government-appointed agent of change.

The act of faith is that competition leads to more choice and therefore better value. The Regulator would cite the contract market for industrial and commercial customers, where active competition has been introduced. There have been 10-20 percent price cuts and better products and more variety are now available. Some 65 percent of large customers have moved to competitors in the last two years and 20 percent of medium customers have moved in the last 12 months.

Various alarmist reports have emanated from BG suggesting that acceptance of the MMC report could lead to price rises of 90 percent for many users, or that two-thirds of domestic customers would face an increase – particularly in the most vulnerable sections of society. The

Regulator believes that the 'freezing granny' argument is not a soundly based reflection of BG's real costs of supplying these customers. In reality, competitive markets would not price in this way nor would the Regulator allow BG to abuse its monopoly position. In the Regulator's view, there are prospects of a 10 percent cut on average for domestic customers. What would happen in the long term if the supply/demand balance in the United Kingdom is not managed properly in the absence of a monopsonist buyer or if large consumers are allowed to exercise too much market power, is another question. The requirement to publish schedules may also tend to reduce BG's flexibility and indirectly its ability to reduce prices.

Abolition of tariff barriers is an option that has been considered. The problem as far as the Regulator is concerned is that there is no current mechanism whereby entry to the market could be made conditional on a licence to trade as a 'Public Gas Supplier'.

In the medium term, the Regulator expects to see a different market structure, in which there is a new transportation regime and BG is just one of a number gas suppliers (perhaps 20). BG will also need to reorganise dramatically. Ofgas predicts that its role will start to reduce once genuine self-sustaining competition is introduced.

Industry views

Opinions vary as to the need to separate assets and the sales business. The independents are naturally adamant that this is the only way to ensure non-discriminatory competition. BG itself sees some merit in taking the step. Almost all producers came down in favour of corporate separation in their submissions to the MMC. This was especially true of those companies which have traditionally regarded BG as their adversary in the United Kingdom (despite the benefits that having such a large and powerful purchaser meant in reducing the risk for field development). However, in joint ventures to develop gas around the world, time and again these very companies try to spread their risks along the gas chain by taking positions in production and transmission and sometimes in the market. They would of course argue that the situation with BG in the United Kingdom is quite different. At least one major went even further and advocated the splitting-up of BG's trading arm into a number of separate franchise companies, while some shippers also support local franchising as a transitional move to protect those domestic customers who are in the weakest buying position while the market adjusts to full competition.

Others would caution that it is unlikely that the MMC or the government is fully aware of how little international precedent there is to support the MMC recommendations.

The independent marketers and their 'shippers forum' represent one of the strongest lobbies at the moment. They include many energy companies, such as the regional electricity companies, that have diversified into downstream gas to capitalise on their marketing skills and existing customer bases; also downstream sellers of fuel oil, LPG and coal. Several of these obtain their supplies by means of a joint venture with a gas supplier, who sees advantage in not having to find large numbers of customers and bill them. There are also a multitude of small players (over 100) trading in release gas. This requires little stake beyond certain financial guarantees to cover the take-or-pay element of the annual contract. Many of these are effectively nominee companies for the larger independents. Some, however, actively contribute to the development of fresh markets such as for spot and interruptible gas.

There are clearly too many players and only those who can achieve a reliable means of obtaining significant volumes of low-cost supplies will survive.

It is easy to undercut BG on price because of transparency in the tariff schedules but there is no reason why this should continue when there is no longer a dominant BG. Will the independents be able to compete on price? Many observers look to a future where competition is on quality of service.

BG presently presides over the supply risk. What will happen in future? Will any split-up hasten the development of shorter-term gas contracts, spot markets and even futures markets, as in the United States? Or will the preoccupation of BG management on restructuring actually hinder innovation?

If BG is correct in its assertion that there is no cross-subsidy then splitting up the two businesses will not in itself increase efficiency or reduce transportation costs. The process may in fact disclose hidden costs, for example in the medium-pressure transmission system.

The industry does not believe that Regulators just bow out and there is a feeling that the role of the Regulator needs thorough review now the seeds of change have been sown.

Current issues

Gas itself has been subject to several policy U-turns over the years. The 1967 White Paper enshrined gas as being too valuable a commodity for use merely for generating power. And yet with the recent DTI approval of National Power's Didcot plant, 25 percent of total generating capacity for England and Wales will be gas-fired.

The absence of an integrated government energy policy has caused continuing embarrassment as more and more energy issues have gained prominence on the political stage, such as the coal debate. The lack of a proper framework makes the government's decision-making task that much more awkward, especially as there is no clear model for what is expected from an integrated privatised monopoly.

The government has to decide whether to accept all or part or none of the MMC recommendations. Even if the government were to accept the MMC report as it stands, the detailed way forward is unclear, as little thought seems to have been given to exactly how the findings would be implemented. There might well need to be a series of 'mini MMC reports', which would add further confusion, delays and uncertainty. By accepting the MMC recommendations, the government would implicitly be removing the option of leaving BG in its present form. It is to be hoped that the government would have the courage to re-examine what have been presented as self-evident truths (for example, the total separation of gas trading and transportation and storage) but which are not universally accepted in other countries.

Rejecting the report would tend to undermine the authority of the Regulator at a time when Sir James' successor has just been appointed and the pressure causing BG to change could falter.

Some issues that seem to require some further thought are:

- The abolition of the domestic monopoly – if so, how and when? Some would argue that lengthy transitional arrangements and delays favour BG. Others are more fearful of wholesale change for change's sake, especially the effect on the small consumers without trade organisations to speak on their behalf. Up to now, their champion has been Ofgas.
- Why not abolish the 1,500 therm per year threshold? It would be an alternative mechanism (and some would argue much more effective one) for introducing competition.
- Effect on financial and technical security of supply.
- Obligations on suppliers.
- Effect on prices. A number of independents have just produced a much-publicised report that says that everyone will

benefit. But surely that is just what one would expect them to say?

- Should the regulatory framework now apply to players other than BG? What about offshore transportation?
- What financial returns are appropriate for BG (and others) and how are they to be computed?
- How will BG shareholders fare, many of whom contracted to buy the shares on the basis of the government prospectuses and who now may find that the government wants to change the rules?
- It has been estimated that it will cost £300 million to restructure BG. Who will pay this bill – the customer?

It would be interesting to speculate whether a world-class gas company would have to hold one arm behind its back if it happened to reside in France or Germany rather than Britain. Equally, it could be argued that domestic competition can only benefit BG's ability to compete abroad and that the inefficiencies created by monopoly are holding it back.

The report comes at a time when the government has just about got away with the decision to levy VAT on domestic fuel supplies. It cannot afford too many other mishaps of its own making.

There is also an international aspect. If one wishes to extend choice within the United Kingdom, it is only logical to press for it be applied to the international arena. The decision may therefore be linked to approval to proceed with the gas interconnector to Europe. The interconnector is seen as a means of sharing in the upward trend in gas prices and demand in Europe. The price of alternative gas supplies on the continent is sufficiently high to convince the policy-makers that the project would help rather than hinder the development of UK gas fields, even if the agenda includes more imports from Norway. However, if gas prices equalise at the cost of alternative fuels (in which there is an international market) together with the usual premium factors to do with the convenience of gas, then one would expect gas prices to equalise on either side of the interconnector after a period of time, leaving the United Kingdom subject to the additional Norwegian imports. Hence there may be a hidden issue of foreign versus UK jobs.

Overall, there is a balance to be struck between the reallocation of cost drivers and the social and political pricing outcome. Whatever solutions are adopted, the government must ensure adequate rewards that lead to a secure industry, refreshment of UK supplies and encouragement for novel onshore developments like coalbed methane.

Winners and losers

If the MMC report is accepted, the winners would undoubtedly be the big consumers, the producers and the Regulator. Although the independent traders have been among the first to welcome the MMC report, their margins are likely to continue to be eroded and it seems inevitable that many of the smaller companies will not be trading in a few years' time, even if transmission costs come down. BG staff would definitely be the losers (many thousands will lose their jobs) and BG itself would certainly not come out of it unscathed. BG shareholders might even benefit from the changes if the divestment were handled with the City's customary degree of legerdemain.

It remains to be seen whether the small household customer such as you or I will really stand to gain in the long run.

This paper is based on the talks given to the IP Energy Economics Group last October by Mr Gregor McGregor, Director of Competition and Tariffs at Ofgas, and by Mr James Ball, Senior Partner, Gas Strategies.

IP THE INSTITUTE OF PETROLEUM

Exploration & Production Discussion Group Survey

The E & P Discussion Group Committee carried out a survey recently in order to assess whether their evening meetings were providing what members wanted. In addition it wanted to eliminate duplicate or unwanted mailings from its current list of 270 members.

In order to encourage people to reply, a prepaid envelope was included with the questionnaire. The lucky winner of the bottle of champagne was Chris Johns of British Gas who was presented with his prize on the evening of his talk to the group on the Former Soviet Union. In his opening remarks he noted that there were too many people present to share the bottle with and, in any case, it was also his wife's birthday!

Response to the survey was good (26%) with the majority (86%) of those going to the correct address and only 17% receiving duplicate notices in the mail. Direct mailing was the most effective means of publicity (64%) with Petroleum Review (28%) reaching the actual audience, who are not necessarily members of the group. There was considerable support for the group in that 94% said that they wished to remain members and 79% thought that the IP and the group meetings met their needs.

We seem to be getting it roughly right as 88% had nothing they disliked about the meetings. However, because three quarters of members did not respond, some doubt remains about whether we are achieving our aims and these members will be sent a letter shortly to ask whether they wish to remain on our mailing list.

It is interesting to note that 35% identified the subject matter as most important and people attend meetings as an extension of their work, to keep themselves up-to-date and to meet other business contacts. Our members also belong to a vast array of professional institutes and associations, are mostly aged 35 to 55, employed by oil & gas producing companies (44%) or companies providing services to the industry (32%) having worked in the industry for an average of 18.3 years within the Management, Engineering, Exploration and Finance disciplines in that order of priority.

An ongoing survey of people who attend the meetings is also being carried out. The many useful comments and suggestions on the forms will be used by the committee in planning future events.

Any IP members who would like more information or to join the E & P Discussion Group should contact Sjoerd Schuyleman.

IP INFORMATION SERVICE NEWS

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SELECTED ADDITIONS TO LIBRARY STOCK

This list represents only a fraction of the additions to Library stock since the last Information Service News in July. Most of the items, other than directories, are available for loan to IP members. Please note all the items were published in 1993.

DIRECTORIES

1994 Petroleum Software Directory. 10th edition. PennWell.
1994 Worldwide Refining and Gas Processing Directory. 50th edition. PennWell.
Financial Times Oil and Gas Year Book 1994. Longman.

ECONOMICS/BUSINESS/POLICY

ENI long term outlook. ENI.
Energy policy Errors, illusions and market realities. INSTITUTE OF ECONOMIC AFFAIRS. By: Robinson C. Occasional paper no 90.
Gas and British Gas plc: Volume 2 of reports under the Gas and Fair Trading Acts. MONOPOLIES AND MERGERS COMMISSION. Cm 2316. HMSO.
Gas and British Gas plc Volume 3 of reports under the Gas and Fair Trading Acts. MONOPOLIES AND MERGERS COMMISSION. Cm 2317. HMSO.
The US petroleum industry Past as prologue 1970 - 1992. US DEPARTMENT OF ENERGY INFORMATION ADMINISTRATION.

MAPS

Energy map of India. Petroleum Economist.

ENVIRONMENT

Emissions of greenhouse gases in the United States 1985 - 1990. US DEPARTMENT OF ENERGY INFORMATION ADMINISTRATION.
Guide for assessing and remediating petroleum hydrocarbons in soils. AMERICAN PETROLEUM INSTITUTE. 1st edition. API Publication 1629.
1993 Annual book of ASTM standards: Section 11 - Water and environmental technology Volume 11.03 - Atmospheric analysis; occupational health and safety; protective clothing. ASTM

STANDARDS/SPECIFICATIONS

Specification for drilling-fluid materials. AMERICAN PETROLEUM INSTITUTE, 15th edition. API Spec 13A.
Recommended practice for design, selection, operation and maintenance of marine drilling riser systems. AMERICAN PETROLEUM INSTITUTE. 1st edition. API RP 16Q.
Recommended practice on application and testing of electrical submersible pump seal chamber sections. AMERICAN PETROLEUM INSTITUTE. 1st edition. API RP 11S7.
Manual of petroleum measurement standards
Chapter 20 Allocation measurement. Section 1 Allocation measurement.
Chapter 21 Flow measurement using electronic metering systems Section 1 Electronic gas measurement.
Chapter 14 Natural gas fluids measurement. Section 1 Collecting and handling of natural gas samples for custody transfer. AMERICAN PETROLEUM INSTITUTE .
Specification for automotive fuel. BRITISH STANDARDS INSTITUTION. BS EN 590 1993.

OIL LOSS

The fifth oil measurement conference - New developments in tank calibration and meter proving: Unedited papers from conference held 4 November 1993 at Institute of Petroleum. INSTITUTE OF PETROLEUM

OFFSHORE SAFETY

Guidelines for Offshore Emergency Training. Issue no 2. UKOOA,
Recommended practice for design and hazards analysis for offshore production facilities. 1st edition. API RP 14J.
Guidelines for offshore installations safety case diving operations from vessels. A joint industry guide. UKOOA.
Guidelines for safety-related telecommunications systems on normally-manned fixed offshore installations. UKOOA.
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Bottom-loading and vapour recovery system

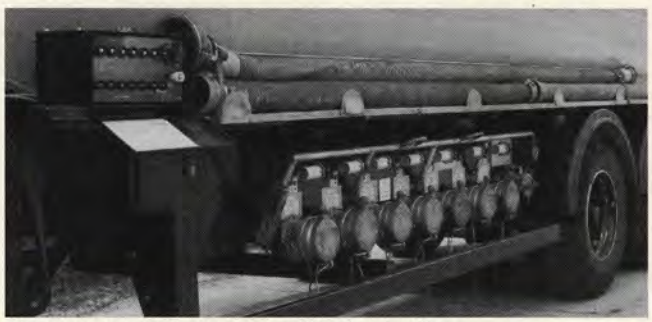
George Meller Ltd has just fitted its first new bottom-loading and vapour recovery system for Murco Petroleum.

Manufactured by F A Sening of Germany, the system meets European Community pollution control standards, as well as offering operators faster loading, spillage elimination and vapour collection at both loading and delivery points.

The system's pneumatic controls have been designed and built by Meller, and have been engineered for system reliability and safe performance, together with ease of operation.

The true sequential vent valve system ensures safe loading and guards against tank damage. In addition, a unique sealing configuration in the API and footvalves minimises the possibility of valves sticking open. All footvalves are non-pressure balanced.

System options include lever-operated API or pneumatic API – offering the advantages of split drop facility.



New vapour recovery system offers fast loading

Pipework system for filling stations

Durapipe of Cannock has launched Petrol-line, a new thermoplastic pressure pipework system designed specifically for off-set fill, vent and vapour recovery use at petrol filling stations.

Leak-free and petrol-resistant, the system is robust, easy to install, non-corrosive and suitable for use in confined spaces. Pipes and fittings are jointed using the electrofusion welding technique.

The pipes are co-extruded from a combination of modern thermoplastic materials. A specially formulated high-density, low-permeability material is surrounded and protected by an ultraviolet-resistant black outer layer.

Matched pipes and fittings are produced in 63mm, 90mm and 110mm outside diameter. The range of fittings includes 90° elbows, 45° elbows, equal tees, reducers, end caps, together with flanges and BSP composite unions for connecting to threaded metal pipes and fittings.

The socket of an electrofusion fitting incorporates a precision-wound electric heating coil. When a current is passed through the coil, the heat generated causes the surrounding material to melt and form an expanding pool which comes into contact with the pipe surface. This in turn becomes molten, leading to fusion of pipe and socket. High integrity, consistently reproducible joints can be made in this way.

The design of the fitting will determine the quality of the electrofusion joint: heating coils must be accurately positioned within the fitting, heat distribution during melting must be uniform over the coupler length and must be closely controlled, and coils must be protected from damage during installation.

Petro-line for filling stations

On-truck computer

An on-truck computer designed to give product security has been launched by Drum Engineering and is already being used by Esso and Total.

It provides drivers with loading, routing and delivery details, monitors fuel consumption and warns of maximum permitted driving time. The Total system also incorporates radio data communication which enables the remote transfer of information between vehicle and depot.

'It all adds up to the vehicle cab now taking a giant pace forward with computer, printer and communication equipment revolutionising the traditional job of the driver,' said the company.

Another new development from Drum is a facility called COPS. An acronym for Cross Over Prevention Systems, this is a fail safe device which precludes the wrong type of petrol being pumped from a tanker into garage forecourt storage.

Additive injection for smaller depots

The world's first containerised petrol additive injection system for use at the smaller type of distribution depot has been produced by Hyrolec.

All system components, including the tank, are incorporated within the container, which is easily transported by a standard road vehicle. The first three units have been purchased by Gulf Oil for additive injection into their petroleum product in the United Kingdom.

'Companies need precise injection of the additives and proof that this has been carried out,' said Mr Phil Armstrong of Hyrolec. 'Our systems have been installed at major petrol terminals in many parts of the world but the scale of additive injection systems for major petrol brands at large petrol depots may be out of proportion financially for the smaller type of distribution depot.

'This flexible containerised system, which has a low fixed investment cost, was the result of our studies. All the equipment, including the means to print out the proof of injection, is within the container.

'After the delivery it is easily installed. Then the system just has to be switched on. It operates automatically and the container will be re-opened only when the additive tank is replenished.'

Control and surveillance operations within the Hyrolec Containerised Additive System are by a multi-pulse monitor, which is a purpose-built processor providing high-level intelligence in the hazardous area to enable control and reporting functions to be carried out cost-effectively.

The additive tank is sized to suit customer requirements generally and is based on throughput and additive availability. The tank assembly is within a containment bund, which is leak-monitored.

Lift with intelligence

The Morlift Lift Management System, from Hydra-Tight Morlift Systems, incorporates sophisticated computer control and recording of a high load hydraulic jacking system.

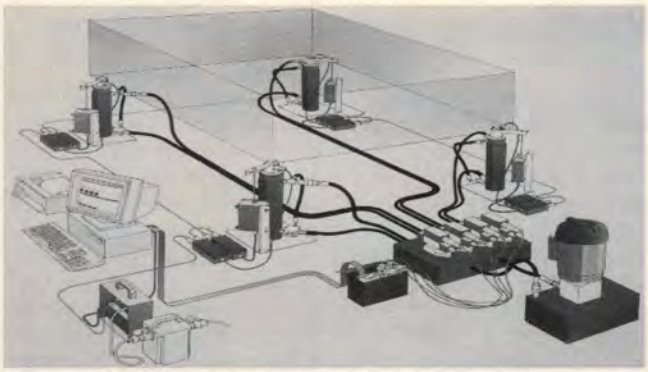
The standard software programme allows up to 24 transducers within a ring main, but up to 100 transducers can be accommodated with a custom software option, allowing control over a wide area to be easily accomplished.

The transducers, which monitor load, pressure, displacement or any combination of those three, are connected via a loop to the computer. The computer software continuously interrogates the transducers, making comparative decisions and controlling the lifting operation within pre-set parameters. The system controls the hydraulic valving, energising and de-energising up to 1,500 times per minute.

The software programme provides a framework which requires specific information for each application, providing user definable variations such as lift tolerances, hysteresis, end of stroke, overload limit, load shift detection and transducer logging to disc or printer.

The system also provides a graphic display on screen to show the operator each function. For example, each transducer is represented as a bar on a chart to show each fraction and if an error condition is detected the visual display is enhanced by a change in colour from green to red. Once remedial action has been taken, the stop condition can be manually overridden.

Conceived as a lift management system, its versatility allows it to be a weighing system also. This is especially useful in the oil industry where weight, weight distribution and centre of gravity are essential pieces of information when the movement and placing of any large structure is carried out.



Intelligent hydraulic system for the oil industry

Data management in a box

Rockall Data Services has launched its Box Management System, RBMS, developed specifically for oil and gas companies and requiring low cost offsite information storage and retrieval facilities. The PC-based solution is said to represent a significant advance over the traditional paper-based method of boxed data management.

The system uses cost effective barcode technology to register and retrieve boxed data. This method of locating boxes ensures a high degree of accuracy and a subsequent reduction in retrieval time. Data management costs are kept to a minimum as customers are allowed to create their own databases and generate reports on the status and location of information.

Run on any DOS-based PC, the system is provided free of charge, with users paying storage fees in the usual way. The initial outlay is therefore minimal and for existing clients the system therefore provides improvements in service at no extra cost.

Water-corrected lens

A new approach to underwater CCV camera design has been developed by professional diver and equipment designer, Mr Peter Bourne and his Essex-based company, Hydro Optic, in collaboration with Surrey precision engineering company, Carville Ltd.

The camera concept addresses the technical limitations and high costs associated with many conventional systems and combines close-tolerance engineering with sophisticated, reliable but inexpensive electronics and very specialised optical features.

Capable of producing the high resolution images required for the real-time monitoring and video recording procedures involved in underwater investigation and salvage work, the new camera system introduces an innovative acrylic lens produced by Carville.

The diamond-machined and super finished lens is crafted from stress-relieved cast acrylic material and provides optical characteristics which overcome water refraction problems and so present real-size objects to the camera's electronic imaging system.

There are two versions of the camera, the 16250 Low Lux monochrome unit and the 16250 colour model. Both are capable of reliable operation within the low temperature and 100 bar high pressure environments experienced at depths of over 1,000 metres.

The camera system packages include standard and wide-angle lens options.

Solving hard water scale

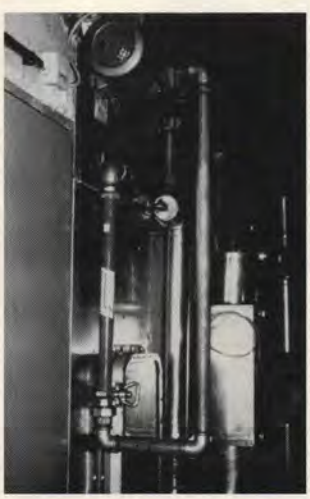
It is well known that scaling formed from hard water causes many problems for maintenance, process and production engineers.

An in-line catalytic water treatment system called Colloid-A-Tron has been designed to solve the problem.

Manufactured by Fluid Dynamics International, the unit causes a rise in the pH of water passing over it. This rise triggers a scaling reaction in the water in the vicinity of the core which causes the calcium carbonate present to form tiny microscopic crystals. These then pass harmlessly through the system, claims the manufacturer, without sticking to pipework or equipment.

One of the major benefits of the product, which is generally leased, is that it uses no chemicals or energy and can handle a wide range of water qualities.

Companies already using the unit include Guinness, Zeneca, Nestle, Carlsberg, Lucas and Rhone Poulenc.



A Colloid-A-Tron unit

Hardening process for tubes

Parker Suparcase, a new process for hardening the ferrules of stainless steel tube fittings, provides liquid and gas carrying instrumentation systems with increased reliability. Fittings are also much safer when operating in hostile environments because the hardened ferrules resist the causes of corrosion.

The process, which has been developed by Parker Hannifin, is used in the manufacture of the company's twin ferrule A-lok and single ferrule CPI ranges of fittings. These fittings are made from 316 austenitic stainless steel and employ a ferrule design which is hardened.

Characteristic features are: complete infusion into the 316 substrate without causing any change in the dimensions of the ferrule; the core structure of the substrate remains unaffected; greater surface hardness than available with untreated 316; and a lower coefficient of friction due to the higher surface hardness, which eliminates damage due to galling.

A ferrule is the key element in compression type fittings designed for the instrumentation market. It must be capable of resisting high pressures after the connection has been made, and withstand the effects of corrosion when working in unfriendly environments.

Oil patch directory

The sixth edition of an on-disk directory of the North Sea oil and gas industry is now available from its publisher, Douglas-Westwood.

The Oil Patch Directory (OPD) continues to grow and this latest edition contains over 3,800 screens of information on suppliers of products and services, official organisations, plus oil companies in 180 locations. It operates under all recent versions of DOS (including DOS 6.0), loads onto your machine in a few minutes and takes up about 4.8 megabites of hard disk space.

Operation is very simple and companies can be located by name, or by selecting one of over 600 categories and sub-categories of product and service. Type in the name of the product you are seeking and up comes a list of suppliers.

Another feature is the facility to store notes on each company. Like all the personal information inputted, these notes are not overwritten by loading in the next half-yearly edition of the directory. The programme also includes an appointment calendar and phone book.

Available at an annual subscription of £49.00 plus VAT, the directory allows North Sea contractors, oil companies and industry buyers worldwide to locate suppliers of products and services.

Ready-made steel island forms

Ready-made steel island forms designed to speed up the construction and renovation of service stations are now available throughout the world from Hockman-Lewis Ltd.

A full range of service station products are on offer, constructed of heavy 12-gauge prime steel plate and featuring a rolled-in rub-rail bead.

Manufactured by Formex, the islands can be ordered in galvanised or stainless steel, for attractive appearance and low maintenance. Double bracing on the sidewalls helps prevent bowing and bulges. Adjustable top braces allow faster, more accurate installation of dispenser boxes and placement of light or canopy poles. Configurations are available for nearly every dispenser brand.

Products are available for any type of service station layout and include the Dogbone form for today's multi-product dispensers, together with standard island forms, dispenser boxes, curbing, pipe and bumper guards and sign and light pole bases.

Recycled oil in Shell packs

Shell Oil's one litre and four litre Helix Oils packs now include recycled plastic which has been collected from both domestic and industrial waste.

The move is the culmination of a year of tests and trials. The range uses a mixed material single layer process, which was developed by RPC Containers Raunds, who supply the packs.

'The critical issue was to be able to achieve similar colours and pack performance whilst including the recycled materials,' said Mr Tim Stafford, Shell Oil's Packaging Negotiator.

According to Shell, the policy is designed to help stimulate the market for recycled polyethylene and is part of its environmental strategy.

Shell Oil packs incorporate recycled plastic

CONTACTS

George Meller	081-579 2111
Durapipe	0543 279909
The Drum Engineering Company	0274 683131
Hyrolec Technical Services	0329 825823
Hydra-Tight Ltd Morlift Services	0543 677151
Rockall Data Services	081-242 4155
Carville	0306 881681
Fluid Dynamics International	0753 887213
Parker Hannifin	0271 22591
RPC Containers Raunds	0332 293939
Douglas-Westwood	0227 831879
Hockman-Lewis	201-325 3838

PEOPLE

Mr Kenneth T Derr, Chairman and Chief Executive Officer, Chevron Corp, has been elected Chairman of the American Petroleum Institute, generally known as API.

The Board of British Gas has appointed **Mr Richard V Giordano KBE** as Chairman with effect from 1 January. Most recently he was Chairman of British Oxygen Co, a post he relinquished in 1992.

Mr Michel Romieu has been appointed Managing Director of Elf Petroleum UK plc, the holding company for the Elf group's hydrocarbons interests in the United Kingdom. He continues as Managing Director of Elf Enterprise Caledonia Ltd.

Enterprise Oil plc has announced that **Mr Michael Pink** is to join the Board as Chief Operating Officer on 1 May to be responsible for exploration, development and production activities. For the past 30 years Mr Pink has served the Shell group in various capacities.

Sir Bob Reid has been appointed a non-executive director of British-Borneo Syndicate plc. After many years with Shell, lastly as Chairman and Chief Executive of Shell UK, he is currently full-time Chairman of the Board of British Railways. He has also been made a non-executive director of London Electricity, with effect from 1 April.

LASMO plc has announced that its Chairman, **Lord Rees**, expects to stand down after the next Annual General Meeting in May.

Mr Charles Watson has become Managing Director of Quadrant Gas, the Shell/Esso gas marketing joint venture company, set up in 1989. Its business is to purchase and sell natural gas in the UK market.

Dr George Mowatt has been made President and Chief Executive of Kvaerner H & G Offshore Ltd in succession to **Mr Dan L Murphy**. He was previously General Manager of Kvaerner Earl and Wright, the marine division of Kvaerner H & G Offshore.

Dr Manfred Fuchs has been appointed President of the European Union of Independent Lubricant Manufacturers, with effect from 1 January. He is Chairman of Fuchs Petrolub AG OEL + Chemie.

Mr Ian Meadows OBE , Managing Director of RS Clare & Co Ltd, has been elected President of the British Lubricants Federation. His company is one of Britain's few specialist lubricating grease manufacturers.

Mr Ian Johnson, the partner who heads the Energy and Natural Resources Group at Ashurst Morris Crisp, has recently been elected Chairman of the UK Oil Lawyers Group.

The Mannai Corp, based in Qatar, has appointed Mr John Halfnight as its new Chief Operating Officer. He was previously President Director General of Simon Environment SA.

Amoco Corp has announced the appointment of **Mr Harry MacMillan**, currently Director of Public and Government Affairs for the company's European operations, to the post of Manager, Public and Government Affairs, International Operations, based in Chicago. He will be succeeded by **Mr Neil Chapman** who joins Amoco from Biwater Ltd.

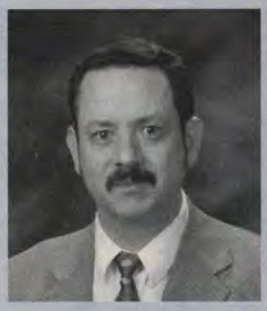
Mr Steve Tinsley will head the Robert Gordon University's new offshore management centre.

Mr Martin Thurlow has been appointed Project Development Manager for ARCO British Ltd. He will be based at Guildford, Surrey.

Tankmaster Ltd has appointed **Mr Kevin Kiely** as Customer Service Director.

Mr Phil Durbin has set up a consultancy, Phil Durbin & Associates offering services to the retail oil sector.

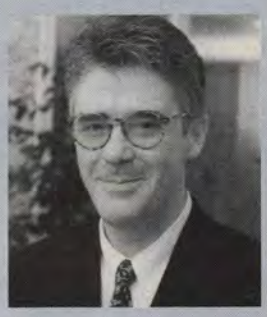
Powell Duffryn Terminals Ltd have appointed **Mr Colin Scott** as Commercial Director and **Ms Hazel Franklin** as Sales Executive.



Mr Len Dever has been appointed Managing Director of Aberdeen-based Gerard Engineering Ltd. He succeeds Mr Chris Austen who founded the company in 1989. Mr Austen continues as working Chairman and will be concentrating on business development and corporate strategy.

Mr John Oakland has been elected as Senior Vice-President of Bechtel Corporation.

Montrose Fire & Emergency Training Centre has appointed **Mr Richard Stevens** as Business Manager. Mr Stevens will be responsible for the finance and administration functions. He will also act as Company Secretary



The Offshore Petroleum Industry Training Organisation has appointed Mr Lawrie Bain as its first Deputy Chief Executive. He worked previously for Amerada Hess, Total Oil Marine plc and in training for the ship-building industry.

INSTITUTE NEWS

NEW FELLOWS

Mr G Cardinal
Following a degree in Economics from Sheffield in 1969, Mr Cardinal started his career with Mobil, as Public Affairs Manager, Mobil Europe. He was subsequently General Manager, Mobil Oil Cyprus Ltd, Chairman, Mobil Oil Norge AS, Chairman, Mobil Oil Austria AG, Marketing Services Manager, Mobil Europe Ltd. His present position is Chairman and Chief Executive, Mobil Oil Company Limited.

Guest of honour Mr Charles Smith (fifth from right, above) is pictured with members and guests at last year's Shetland Branch Annual Dinner. From left: Mr Alan Veale, Mr Peter Guy (Secretary), Mr Jim Wallace MP, Mr Terry Kirchin, Mr John Robertson, Mr Peter Watson (Chairman), Mr Kenny Crossan and Mr Iain Tulloch.

Top table guests at last year's Aberdeen Branch Annual Dinner. It was the best attended Annual Dinner so far with 475 present.

Dr Rex Gaisford
With a Doctorate in Structural Engineering, Dr Gaisford joined Rendell, Palmer & Tritton in 1969. He moved to Britoil in 1978, as Project Manager, then General Manager, responsible for the Nigg Oil Terminal, then Beatrice Field. From 1985 to 1988, as Managing Director of Beatrice Resources, Dr Gaisford was commissioned to develop Amerada Hess's Ivanhoe and Rob Roy developments. Joining Amerada Hess in 1988 as Manager of Projects, he is now Amerada's Director of Development Business, responsible for all operated and non-operated developments of the company in the UK and internally outside the USA, and for its London Technical Department.

Mr T P Ramsey
Eur Ing Ramsey chairs the IP Electrical Committee and is a committed member of several other technical committees. With a degree in Electrical Engineering, he joined Esso Petroleum as an Electrical Engineer in1984. Within three years he had been promoted to Supervisor and Special Projects Co-Ordinator at Purfleet and in 1990 to his present post as Group Head, Electrical and Instrumentation. His current responsibilities entail both maintenance and project work for all the Esso UK terminals, bulk plants, LPG and bitumen installations.

Mr M Schofield
Mr Schofield graduated in Mechanical and Aeronautical Engineering and, after a number of years in the underwater defence and aerospace industries, joined Burmah Oil in 1973 as a senior project engineer. Subsequent project management appointments in BNOC and Britoil culminated in his appointment as Engineering Manager.

Guests at the Irish Branch Annual Dinner last year. From left: Mr Tom Garvey (Deputy Director General, European Commission), Mr Gerry McManus (incoming Chairman), Mr Noel Treacy TD (Minister for Energy) and Mr Duane Deines (Chairman).

UK Deliveries into Consumption (tonnes)

Products	*† Oct 1992*	** Oct 1993*	*† Jan-Oct 1992*	** Jan-Oct 1993*	*% Change*
Naphtha/LDF	253,055.0	251,522.0	2,732,883.0	2,511,889.0	-8
ATF - Kerosene	580,596.0	646,873.0	5,726,235.0	6,008,169.0	5
Petrol	2,047,109.0	1,949,064.0	19,941,393.0	19,243,508.0	-3
of which unleaded	995,700.0	1,051,967.0	9,250,079.0	10,059,221.0	9
of which Super unleaded	125,801.0	117,952.0	1,168,679.0	1,184,791.0	1
Premium unleaded	869,899.0	934,015.0	8,081,400.0	8,874,430.0	10
Burning Oil	222,371.0	223,222.0	1,937,231.0	2,029,662.0	5
Derv Fuel	988,352.0	1,037,193.0	9,211,630.0	9,725,027.0	6
Gas/Diesel Oil	670,492.0	660,904.0	6,438,830.0	6,282,903.0	-2
Fuel Oil	880,386.0	771,575.0	9,114,661.0	8,630,777.0	-5
Lubricating Oil	69,331.0	62,497.0	649,488.0	634,696.0	-2
Other Products	636,853.0	628,432.0	5,850,470.0	6,076,001.0	4
Total above	**6,348,545.0**	**6,231,282.0**	**61,602,821.0**	**61,142,632.0**	**-1**
Refinery Consumption	518,113.0	563,441.0	5,041,615.0	5,267,677.0	4
Total all products	**6,866,658.0**	**6,794,723.0**	**66,644,436.0**	**66,410,309.0**	**0**

*+ Revised with adjustments *Preliminary*

In 1984, he was appointed Managing Director of C-E Offshore Production Systems. He is now an independent project director, managing turnkey offshore project developments for operating oil companies in the Middle East and Asia.

Mr M H Bowen
With a degree in Applied Chemistry and a MSc in Analytical Chemistry, Mr Bowen's early career was spent with Unilever, the Laboratory of the Government Chemist and Rio Tinto Zinc. He joined Ethyl Corp in 1976, transferring to Duckhams as Manager Customer Technical Services in 1980 and to his present position as Technical Manager with Morris Lubricants in 1986. He has served as a Committee Member and, more recently, as Treasurer, of the IP Midlands Branch.

Dr M Ll Pritchard
Gaining a doctorate in in Chemical Engineering in 1963, Dr Pritchard joined Burmah Castrol in 1968 as a process engineer at Ellesmere Port, becoming Deputy Operations Manager 10 years later. In 1982 he joined Lummus Crest as Chief Process Engineer, Refining, and in 1986 moved to Costain Engineering Ltd. In 1990 he was appointed Engineering Manager (Cheshire) with Cremer & Warner Ltd.

NEW MEMBERS

Mr A W Ahken, 108 Langton View, East Calder, Livingston, West Lothian, EH53 0RA
Dr M Alerassool, 23 Orchard Avenue, London N3 3NL
Mr W M Allan, Salamis (M & I), Greenhole Place, Bridge of Don, Aberdeen AB23 8EU
Mr S C Allvin, Dacoma Inspection Ltd, PO Box 61, Goteborgsvagen 49, s-463 22 Lilla Edet, Sweden
Mr A P Armstrong, 14 Forbestfield Road, Aberdeen AB1 6PA
Mr J M Arnold, 15 Vicarage Close, Erith, Kent DA8 1ET
Mr Z Bakar, Shell (M) Trading SDN. BHD, Shell House, Off Jalan Semantan, Damalisara Heights, 50490 Kuala Lumpur, Malaysia
Mr M Baker, Ferndown, Doggetts Wood Close, Chalfont St Giles, Bucks NP8 4TL
Mr V I Baseley, Baseley & Co Pte Ltd, No 1 Magazine Road, # 05-27, Central Bldg, Singapore
Mr M D Borley, BP Oil UK Ltd, Bp House, Break Spear Way, Hemel Hempstead, Herts HP2 4UL
Mr R Bosher, Amoco Poland, The Green House Offices, ul. Hankiewicza 2, 02-103 Warszawa, Poland
Mr D J Bubley, Datamonitor, 106 Baker Street, London W1M 1LA
Mr R Burnett, Scotvalve Services Ltd, Unit 14, Woodlands Drive, Kirkhill, Aberdeen AB2 0ES
Mr A Cadger, Rollstud Ltd, Units 5-7, Denmore Ind Estate, Bridge of Don, Aberdeen AB23 8JW
Mr S L Chan, Rm 1013 Wan on House, Wang Tau Hom Estate, KLN, Hong Kong
Mr S Chapman, Inchcape Testing Services, Rezayat Co Ltd, Caleb Brett Division, PO Box 216, Rahima, Via Dhahran, Saudi Arabia
Mr R S Chin, 18A Fung Fai Terrace, 3/F, Happy Valley, Hong Kong
Mr S Chisholm, MacGregor Engineering Ltd, Dunbar House, Balgownie Road, Bridge of Don, Aberdeen AB2 8JS
Mr M H Clarke, 56 Richmond Drive, Rayleigh, Essex, SS6 7RH
Mr L A Coxon, Lubnaig, 40 Hamilton Street, Barnhill, Dundee DD5 2RR
Mr R D Creswell, 12 Greenbirch Close, Basingstoke, Hants RG22 5JL
Mr K Crouch, Kerr-McGee Oil (UK) Plc, 75 Davies Street, London W1Y 1FA
Mr B F Cunningham, Costain Process, Costain House, Styal Road, Wythenshawe, Manchester M22 5WN
Miss B J Davidson, Wardell Armstrong, 22 Windsor Place, Cardiff CF1 3BY
Mr P E Davis, 24 Sejant House, Bridge Road, Grays, Essex RM17 6RT
Mr J D Dobson, Beechleigh, Station Road, Cults, Aberdeen AB1 9NP
Mr A M Evans, Ralph M Parsons Co Ltd, Parsons House, Kew Bridge Road, Brentford, Middx TW8 0EH
Mr S Ferguson, Ferguson Seacabs Ltd, Harlaw Drive, Inverurie, Aberdeenshire AB51 4SP
Mr N Forrest, SSR International, Wellyeads Crescent, Dyce Industrial Park, Aberdeen AB2 0GA
Mr P R Forsythe, Schlumberger RPS, Unit 4, Cliveden Office Village, Lancaster Road, High Wycombe, Bucks HP12 3YZ
Mr G M Hill, 31 Seaview Terrace, South Shields, Tyne & Wear NG33 2NW
Mr G Hudson, 117 Lincoln Park, Amersham, Bucks HP7 9HF
Mr J R Hughes, 4 Watmore Lane, Winnersh, Wokingham, Berks RG11 5JT
Mr D A Jenkins, 9 Templer Avenue, Chadwell-St-Mary, Grays, Essex RM16 4ER
Mr G W Jones, J R Stansfield & Associates Ltd, Thelwall Industrial Estate, Thelwall New Road, Warrington, Cheshire WA4 2LY
Mr D Karagounis, Bureau Veritas, 26-28 Akti Kondyli, 185 45 Piraeus, Greece
Mr A Kennedy, PA Consulting Group, Hobart House, 80 Hanover Street, Edinburgh EH2 1EL
Dr J B Kenworthy, RSK Environment Ltd, Campus Three, Aberdeen Science Park, Bridge of Don, Aberdeen AB22 8GW
Dr D J Lewis, 8 Quickswood Close, Liverpool L25 4TT
Mr B Lippiatt, 9 Orchard Way, Higher Bebington, Wirral, Merseyside L63 8QN
Ms D Magada, 37 Craven Road, London W2 3BX
Mr E L Marshall, 7 Tudor Way, London W3 9AG
Mr D M McKenzie, Trafalgar House Offshore Holdings, Kings Close, 62 Huntly Street, Aberdeen AB1 1RS
Mr W T Mullins, Dragon Oil Plc, 19 Old Park Lane, London W1Y 3LH
Mr A Q O Muse, Nig. National Petroleum Corp, Production Dept, NNPC-KRPC Ltd, PMB 2252, Kaduna, Nigeria
Mr T J Pitt, Inspectorate Griffith, Unit 7, Manby Road, Immingham, Grimsby, S. Humberside DN40 2PD
Mr K H Poon, Blk 7, 3/F Rosary Villa, No 1 Lok Lam Road, Shatin, Hong Kong
Mr P Resi, Mobil Europe Limited, Mobil Court, 3 Clements Inn, London WC2A 2EB
Mr T Richardson, Saybolt (UK) Ltd, Oliver Close, Riverside Estate, West Thurrock, Grays, Essex RM16 1ED
Mr T Sato, Arabian Oil Company, 61 Brook Street, London W1Y 1YE
Mr O H Saville, Kaldair Limited, Waterside Drive, Langley, Slough, Berks SL3 6EY
Ms J Sherwin, TBCL Ltd, Upton Road, Rugby, Warwickshire CV22 7DL
Mr P J Starns, 9 Aluric Close, Chadwell St Mary, Grays, Essex RM16 4NB
Mr I H Strudwick, RSK Environment Ltd, Campus Three, Aberdeen Science Park, Bridge of Don, Aberdeen AB22 8GW
Mr N Sujan, BP Middle East, PO Box 92, Mina-al-Fatial, Code:116 Muscat, Oman
Mr B E Tem, 2 Malcolm Street, Cambridge CB1 1LL
Mr P Timms, Fox Petroleum Ltd, Kenwood Road, North Reddish, Stockport, Cheshire SK5 6PW
Mr T T Tinuoye, PO Box 1447, Ilorin, Nigeria
Dr P J Tweedale, 17 Tarn Way, Lowton, Warrington WA3 2QJ
Mr R V Walsh, Schlumberger Evaluation & Product, Kirkton Avenue, Pitmedden Indst Est, Dyce, Aberdeen AB2 0BF
Mr S J Warlow, Gulf Environment & Waste, PO Box 17168, Jebel Ali Port, Dubai, United Arab Emirates
Mr M F Westlake, Opal Oil Price Assessment, Walton Court, Station Avenue, Walton-On-Thames, Surrey KT12 1SH
Mr P J White, No 2 The Malting, Kenmure Way, Cleckheaton, West Yorks BD19 4EN
Mrs R M Wright, 62 Oakway Birkenshaw, Bradford, W Yorkshire BD11 2PG

STUDENTS

Mr M J D Purdy, 4 Park Avenue, Cranham, Upminster, Essex RM14 1JS
Mr W D Keil, 5 Windsor Place, Dundee DD2 1BG
Mr S Ammed, 22 Second Avenue, Walthamstow, London E17 9QH
Mr M A Ayoade, 31 Peterson House, 25 Roseangle, Dundee DD1 4JR

STUDENT PRIZE WINNER

Mr M A Jackson, Petroleum Experts Ltd, 21 Lansdowne Crescent, Edinburgh EH12 5EH

APPOINTMENTS / CONSULTANTS

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2001 - A SULPHUR ODYSSEY

A Review of Likely Sweet Crude Supply and Premia

14 February 1994 at the Institute of Petroleum, London

The following papers will be presented:

Current Application and Valuation of Sweet Crudes
Potential Changes in Sulphur Limits on All Products
The Options and Costs of Desulphurisation within Refineries Implications for Premia
Future Worldwide Supply of Sweet Crudes from Proven Reserves
The Outlook for New Discoveries of Sweet Crude
Forecast Demand and Price for Sweet Crude

Forecasts show that the global average sulphur level of crudes is likely to increase significantly in the future. At the same time, legislation is continuing to force down sulphur levels in a wide range of products. This pressure is growing both across the barrel and geographically, reducing opportunities for the absorption of sulphur in less regulated products or markets and making sulphur removal unavoidable. Unlike investment in conversion capacity, which is justified by higher revenue assumptions, desulphurisation investment is primarily driven by cost avoidance – the premium paid for low sulphur crudes. In view of the scale of investment which the refining industry faces, an understanding of the increasingly complex dynamics which determine crude sulphur differentials is needed. It is this issue which the conference will endeavour to address.

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

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Upstream Atmospheric Emissions

17 February 1994

To be held at the Institute of Petroleum

This conference aims to present the methodology used to obtain the results of the Halliburton Study to quantify the emissions from the upstream industry to cover all the offshore installations and their associated onshore facilities, to discuss their significance and to demonstate that, one year on from the Consultative Conference, the industry has made progress in improving the methodology/ measurement techniques and has a strategy for reducing overall emission levels.

The following papers will be presented:

- ▲ Global Climate Change – The Uncertainty
- ▲ UK Government and IPCC Perspectives
- ▲ The Halliburton Study – Methodology and Results
- ▲ UKCS Emissions –An Overview of the Results and Management of the Reduction Strategy
- ▲ A New Approach for Estimating Atmospheric Emissions
- ▲ The Measurement of Atmospheric Emissions

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

IFEG

Information for Energy Group

7th OIL PRICE SEMINAR

Price Formation Around the World

15 February 1994

To be held at the Institute of Petroleum

PROGRAMME

Seminar Chairman: Mr R Patrick Thompson,
President, New York Mercantile Exchange

Three papers will be presented:

- ▲ **Oil Product Consumer Prices within the EC – Past Developments and Trends to Spot**
  C Peter Regnier, Managing Director,
  OPAL Oil Price Assessments Limited
- ▲ **New Trends for Crude and Refined Products Trade in the Americas**
  Shirley S Savage, Editor-in-Chief,
  Platts Oilgram Price Report
- ▲ **Pricing the Unpriceable – The Oil Markets of the Asia Pacific**
  Paul McDonald, Managing Director, Pearl Oil

Exhibits and displays by suppliers of price information will be presented by EMC Energy Market Consultants, Petroleum Argus, Saladin, Telerate and others.

For a copy of the registration form, please contact Catherine Cosgrove, The Institute of Petroleum, 61 New Cavendish Street, London W1M 8AR. Telephone: 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
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Fax: +47 51 80 60 20

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