NOVEMBER 1991

The Institute of Petroleum

PETROLEUM REVIEW

Measurement

Flowmeters–their role in loss reduction in refining

Pipeline

A feasibility study is being undertaken for an ASEAN gas pipeline

Particulates

An IP committee will study and standardize diesel particulate analysis

Retailing

An interview with Brian Stanley of Kuwait Petroleum (GB)

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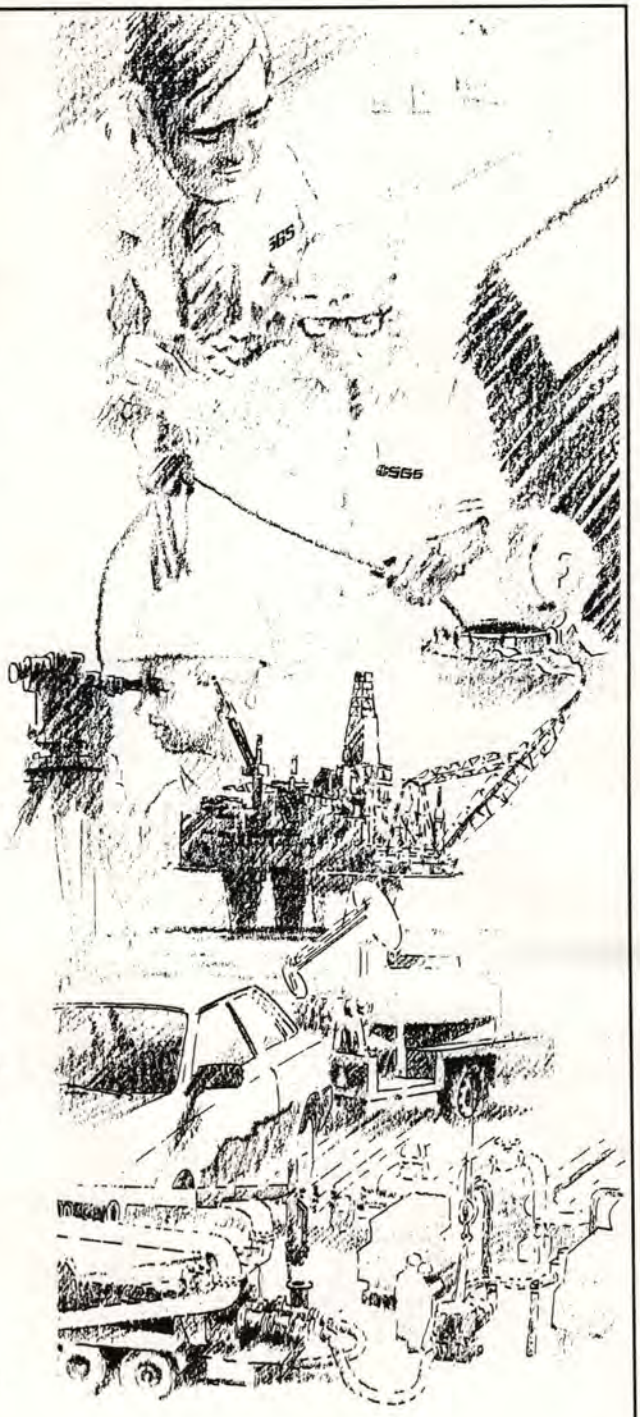

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Cover photo of Ted Williams on the occasion of his retirement.

. . . news in brief

15 September

Singapore's Tiered Area Response Capability oil spill centre is to be upgraded to the level of the Southampton Oil Spill Response Centre.

Norway's Statoil has acquired a 5 percent stake in the former East German gas monopoly Verbundnetz Gas for NKr195m.

French gas utility, Gaz de France, has signed a preliminary agreement with Nigerian Liquid Natural Gas to take delivery of 500 cu m of gas annually for 22 years from 1997.

The exploration arm of Petronas, Petronas Carigali, has signed an exploration agreement with the Vietnamese state oil corporation Petrovietnam.

18 September

Thailand's proven gas reserves are expected to last for at least another 20 years, according to Luen Krisanakri, governor of the Petroleum Authority of Thailand.

19 September

Oman is to increase its natural gas exploitation substantially following the signing this week of a seven year exploration agreement with Bermuda based Transworld Oil.

Lasmo reported that a test drilling programme at the onshore Tempa Ross 2 well in southern Italy had proved successful.

Union Texas Petroleum Holdings has completed the sale of its north American onshore oil and gas business to Meridian Oil, a wholly-owned subsidiary of Burlington Resources.

20 September

Shell Oil is to sell a number of its oil and gas holdings in Alaska. These include the Middle Ground Shoal Production and the Beluga River gas field.

UK independent Enterprise Oil has sold its 19.5 percent stake in the Murdock gasfield to Conoco and Arco British.

BP has decided to use horizontal production wells to develop its Forth prospect in the UK North Sea after a successful appraisal result.

Texaco has disclosed that their UK production will be increased by around 50 percent when the Strathspey field comes on stream in October 1993.

Elf Aquitaine have tested oil and gas with the Jamalulalam Barat 1 well in Brunei, the company's third probe on a field discovered last year.

24 September

British Petroleum has sold its 15 percent stake in the Victor gasfield in the southern North Sea to Total for £40m.

26 September

US oil company Chevron has awarded Norway's Mosvold Shipping three to five year extensions on two drilling contracts on the much-delayed Point Arguello oilfield off California.

Norway's Aker Stord and its Canadian joint venture partners have been awarded a major C$350m contract for the development of Canada's Hibernia oilfield.

The Irish Department of Energy has published a geological review covering the areas which it intends to open up in its frontier licensing round to be held in mid-1993.

28 September

Premier Consolidated Oilfields have reached a farm-out agreement with subsidiaries of Texaco and Nippon Oil in two offshore blocks in the Union of Myanmar.

Showa Shell Sekiyu, the Tokyo-based oil distributor and refiner affiliated with Royal Dutch Shell, has agreed to import crude oil form Sakhalin Island in the Soviet Union.

30 September

A new £4m oil industry research and development facility at the National Engineering Laboratory, East Kilbride was formally opened by Mr Bob Horton, BP Chairman and Chief Executive.

Chevron UK has awarded a contract to Norwegian company K/S Rasmussen Offshore, to provide the flotel Port Royal for offshore accommodation during hook-up and commissioning of the Alba Northern platform.

A new research chair to investigate helicopter damage tolerance is being established at Cranfield Institute of Technology by the Civil Aviation Authority.

1 October

Neste, the Finnish state oil company, has moved into the Gulf through a significant acquisition from Chevron in Oman.

A group comprising BP, Norway's Statoil and the Scottish oil services company Ramco is to take a significant stake in the project to evaluate the Azeri field in the Caspian Sea.

2 October

Ultramar has agreed to sell gas from its Markham field to Gasunie in the Netherlands marking the first UK exports of gas.

US oil company Unocal is to buy Shell's Wilmington refinery in a deal which could help eliminate surplus capacity in the Californian market.

French oil company Elf Aquitaine has signed a $1bn trade agreement with China covering hydrocarbons, chemicals and pharmaceuticals.

3 October

British gas has signalled the start of construction work on a new gas terminal for its North Morecambe development with the award of a £9m contract to civil engineering firm Keller Ltd of Coventry.

A fine of NKr1m has been imposed on Statoil for a leak of diesel fuel at the Norwegian state oil company's Mongstad refinery north of Bergen last year.

British gas announced a successful drilling result which confirms a northerly extension to the Total operated Dunbar field in the UK North Sea.

4 October

Amerada Hess has upgraded oil reserves from its Ivanhoe, Rob Roy and Hamish fields in the UK North Sea by 10 percent to 128m barrels.

US energy services company McDermott International unveiled a major restructuring plan involving asset sales and equity issues designed to reduce debt by $450m.

6 October

Norway's ruling minority Labour party unveiled an expansionary budget for 1992 which heavily increases dependency on petroleum revenue to fund measures designed to boost employment and stimulate domestic demand.

7 October

Norway's Kvaerner group has won two contracts worth more than NKr60m for work on Conoco's Heidrun tension leg platform on the Haltenbanken off central Norway.

A landmark agreement banning oil and mineral exploration in Antarctica for at least 50 years has been signed by 24 of the 26 member nations of the Antarctic Treaty.

Oil companies and dealers in Thailand could earn an additional $98m following deregulation of the local oil market which has allowed them to set up their own marketing networks.

Arthur Andersen has purchased James Capel's Petroleum Services team and its database of information on the upstream oil and gas industry of northwest Europe, the Far East and Australia.

8 October

UK independent Clyde Petroleum has saved 8 percent on development costs for its onshore Waalwijk field in the Netherlands.

A contract worth almost £9 million for the fabrication of a platform jacket and piles for British Gas's North Morecambe project has been awarded to SLP Engineering.

Algerian state-owned oil company Sonatrach has signed contracts with Canadian oil companies Encor and Norcen Energy Resources to carry out exploration in the Sahara desert.

14 October

Kuwait reported that more than 80 percent of its burning oil wells have been put out.

Production has started from Norsk Hydro's Gamma North field in the Norwegian sector of the North Sea via a NKr450m subsea development tied back to the Oseberg facilities.

British-Borneo Exploration has announced commercial gas discoveries on the Brazos 542 and Galveston Island 210 offshore blocks in the Gulf of Mexico.

ENVIRONMENT DISCUSSION GROUP

The next meeting of the Environment Discussion Group will be held at the Institute on **Tuesday, 12 November 1991** starting at **5.30pm.** (Tea and biscuits will be available from 5.00pm.)

Biological treatment of liquid effluents

Speaker: **Denise L Oakley,** Biotechnology Department, AEA Environment and Energy.

If you would like to attend this meeting please contact **Mr AE Lodge,** Institute of Petroleum, 61 New Cavendish Street, London W1M 8AR. Tel: 071-636 1004.

SAFETY/STANDBY VESSELS
THE NEW REQUIREMENTS

26 November 1991

A One-Day Conference to be held at The Institute of Petroleum

This conference is co-sponsored by the Joint Offshore Group of the Institute of Marine Engineers and the Royal Institution of Naval Architects.

Safety/standby ships have been one of the essential services supporting the offshore oil industry for the last 20 years and yet their development has attracted little attention within the oil companies.

This has now changed with the publication of a new Code for such vessels developed in the light of criticism of the role and capabilities of standby ships in the Cullen Report.

The Institute of Petroleum has arranged this conference to bring together oil company marine and safety staff, vessel operators, shipbuilders and designers and other interested parties to consider the requirements of the new Code and other technical, commercial and operational developments relating to the standby vessel market.

The conference will also include presentations by five shipbuilders and marine consultants of their proposals for newbuilding designs which meet the requirements of the new Code and of oil company charterers.

For further details and a copy of the registration form, please contact **Caroline Little, The Institute of Petroleum, 61 New Cavendish Street, London W1M 8AR. Telephone: 071 636 1004. Telex: 264380. Fax: 071 255 1472.**

Sleipner gas alternatives

Statoil has promised to make up the shortfall of gas to customers from its Sleipner field even though the sinking of the Sleipner A platform concrete base will delay on stream production for almost a year.

Plans to deliver the gas from 1 October 1993 have been set back after an accident to the $257 million concrete gravity base which sent it 200 metres to the bottom of the Gands Fjord near Stavanger on 23 August.

A new Sleipner platform is planned to be ready to produce in Autumn 1994 at the latest. Until then alternative gas supplies will be made available from other Norwegian fields.

The platform was due to deliver more than 4 billion cubic metres of gas to Europe during its first year of operation. Germany and France are the biggest customers, taking about 1.5 billion cubic metres a year, with smaller contracts in the Netherlands, Austria and Spain. Deliveries to Belgium will begin in October 1996.

Until 1994 the shortfall will come from spare capacity in the Veslefrikk, Snorre and Tommeliten fields. In addition, associated gas from the Statfjord field, currently part of a reinjection programme, can be tapped and gas production from Heimdal could be increased to meet customer demands.

Half the gas is to be transported via an existing pipeline to Emden in Germany, the remainder by the new Zeepipe to Zeebrugge in Belgium.

Azeri oil

BP Exploration has confirmed that it has reached agreement with the Amoco Eurasia Petroleum Company to participate in the evaluation of the Azeri oil field in the Azerbaijan sector of the Caspian Sea.

A group comprising BP Exploration, Statoil and Ramco Oil Services will take a 20 percent share of the western interest in the project. This will begin with detailed feasibility studies and, depending on subsequent negotiations, could lead to participation in the development and operation of the field.

Amoco will have a 45 percent share in the project. The other western participants will be Unocal Corporation with 25 percent and McDermott International with 10 percent.

Onshore find

Aran Energy Corporation has successfully completed a new onshore gas condensate discovery well in Louisiana, United States of America.

Aran has a 32 percent working interest in the well. Aran's net reserves attributable to the discovery are estimated to be in excess of 2 billion cubic feet of gas and 85,000 barrels of condensate.

Gas and condensate production from the well commenced last month. A second well, to extend the discovery, is under consideration.

Nigeria gas

The Spanish company ENAGAS has agreed to import 1,000 million cubic metres a year of Nigerian natural gas for 22 years starting from 1997, with the option to add 1,000 million cubic metres later.

An international consortium, made up of the Nigerian National Oil Company NNPC and Shell, Elf and Agip will invest $4,000 million in the construction of a natural gas liquefaction plant on the Nigerian coast.

Liquid natural gas will be transported in methane carriers to the regasification plants belonging to the buyers (Huelva, in the case of Spain). Apart from ENAGAS, the Italian company ENEL, Gaz de France and CABOT of the United States will also purchase natural gas from Nigeria.

This transaction forms part of the policy to diversify supplies undertaken by ENAGAS, which begins with a contract to import Norwegian gas by pipe-line at the end of 1993. Also the Spanish company has reached agreements covering the acquisition of Algerian gas and its transport through Morocco, which will permit the building of a gas pipe-line from the Sahara Desert fields to the Spanish network through the Strait of Gibraltar. This pipe-line is expected to come into operation during the last quarter of 1995.

ENAGAS currently distributes 6,000 million cubic metres a year.

Timor Sea attempt

Australia's petroleum industry is about to launch one of the biggest offshore exploration drives in its history in an attempt to solve the geological intricacies of the Timor Sea.

A host of local and multinational companies have decided it is worth risking more money on further appraisal on an area that was considered Australia's most prospective oil province in the early 1980s.

An estimated 22 wells will be drilled in the next six months as companies try to make up for the many disappointments since the discovery of the BHP-operated Jabiru field. In some cases the drilling will represent a final attempt to find oil in commercial quantities.

Melbourne stockbroker J B Were and Sons said in the firm's latest quarterly oil and gas report that several significant Australian companies, such as Santos and Bridge Oil, have spent large amounts of money on exploration without commercial success.

The enthusiasm of these companies is waning but there remains some degree of optimism that oil may be found. One reason for the lack of discoveries in recent months has been a concentration on areas where exploration licences are soon to be relinquished.

Soviet oil decline

Soviet oil production has dropped by almost 10 percent in the first half of 1991, according to a survey by analysts PlanEcon.

As the economic situation in the Soviet Union appears to continue a rapid decline, the report said the 9.6 percent drop in production to 263 million tonnes is the result of mismanagement of resources, inadequate exploration activities and the lack of modern technology.

Also, because the coal industry has been crippled by labour disputes and lack of new investment, domestic consumption of oil has increased, stifling a major source of hard currency for the Soviet Union.

Despite the bad news, however, the report is sceptical about quality of official statistics. It appears that Soviet oil exports statistics omit substantial amounts of data resulting in the underreporting of Soviet oil exports in recent quarters.

Even so, PlanEcon report that, with no crude oil imported, exports dropped to less than 31 million tonnes during January–June 1991, down 50 percent from the same period last year, while the apparent domestic consumption at 116 million tonnes per quarter this year is only marginally down on the 117.7 million tonnes in 1990.

Fabricators face hard times ahead

The North Sea market for offshore platform construction was worth about £1 billion last year, according to energy analysts Smith Rea.

UK fabricators shared the lion's share with Norway but this year the British firms will have a larger slice of the predicted £1.5 billion spend.

But the latest edition of Smith Rea's 'Platform and Module Construction' warns that new Europe-wide competition after 1992 could mark a return of difficult trading conditions in this sector of the market.

The report says: 'In the mid-1980s UK fabrication capacity was reduced by 40 percent; a comparable reduction may be necessary in the mid-1990s' and adds ominously that 'Exports are unlikely to offer a way out'.

The present period of high UK demand — which has meant orders going not only to Norway but to several other countries — is exceptional and probably represents an all-time high. The UK yards, the most important concentration in northwest Europe, currently employ an 18,000 workforce. This is 8,000 up from the 1988 figures when the industry was at its nadir after the oil price collapse but still well below the 1985 numbers of 22,000.

The report said: 'There is evidence of significant productivity growth in fabrication in the United Kingdom throughout the 1980s but a marginal benefit to the companies has only shown in the very recent past as the normal level of fierce competition has temporarily subsided.'

It concludes: 'The future will be increasingly dependent on smaller, lighter platforms and small subsea structures, for which increasing competition can be expected.'

German gas

British Gas has signed a contract which will lead to the acquisition of a shareholding in Verbundnetzgas (VNG), the gas transmission business serving the former German Democratic Republic.

The share (5 percent) enables the company to consolidate further its growing position within the developing German gas industry.

Other non-German shareholders include Statoil, Elf and GasProm (Soviet Union). The German investors are Ruhrgas, Wintershall, East German regional authorities, BEB and Gommern, an eastern German exploration and production company.

VNG owns some 8,000 kilometres of high pressure gas pipeline, of which around 5,000 kms carry town gas and the remainder either indigenous or imported natural gas. This network is expected to grow substantially during the 1990s within eastern Germany.

Welcoming the company's latest acquisition, George Langshaw, British Gas' Managing Director, Global Gas, said 'We are very pleased to join with other international gas and oil companies, and with German shareholders, to invest in an exciting future for the gas industry in eastern Germany.'

Gulf oil dependence grows

Dependence upon Gulf oil will grow steadily over the next two decades, according to energy policy experts with widely differing views on oil market trends. And this outlook holds over a range of oil price and economic growth conditions.

A working group of 36 leading American experts from industry, government and universities reported this finding in a new study released by the Energy Modeling Forum of Stanford University. The working group's conclusions are based partly upon a comparison of the results from 11 models of the world oil market.

Rising oil demand and stable-or-declining supply outside the Middle East will increase the demand for oil from the politically volatile Gulf. Even with steadily higher oil prices, that region's market share is expected to rise from 34 percent in 1990 to 42 percent by 2000 and to 45 percent by 2010 (using the average of the models' results). About two of every three barrels consumed within the United States are likely to be imported by 2010 under these conditions.

Growing dependence of the world economy on these supplies will remain a critical policy issue for major oil-consuming countries.

UK's first independent CCGT

The official opening of the first independent combined cycle gas turbine (CCGT) power station in the United Kingdom signals the start of a new era in the electricity market, said John Wakeman, Energy Secretary.

'It is the first example of what, within the next few years, could become a significant flow of independent producers entering the market to take on the might of the established generators,' he said.

Performing the official opening ceremony of the 230 MW Roosecote power station, in Cumbria, Mr Wakeham said the opening marked a hat-trick for Lakeland Power—whose main shareholders are ABB Asea Brown Boveri and NORWEB—which owns and operates the station.

It was the first independent generator to win a substantial long-term supply contract; the first to receive an operator's licence from the Office of Electricity Regulation; and Roosecote was the first privately owned CCGT station to generate and sell power for public consumption.

BP sells Victor

BP Exploration has announced it has sold its 15 percent stake in the Victor gas field, which is in blocks 49/17 and 49/22 in the southern North Sea, to Total Oil Marine for £40 million.

The southern North Sea blocks in which Victor is located were awarded in the first round of offshore licensing in 1964. The field was discovered in 1972 and production began in 1984. Output this year is expected to average around 148 million cubic feet of gas a day. Gross remaining reserves on 1 September were estimated at 475 billion cubic feet. Sales of all gas from Victor are contracted to British Gas.

Cambodia blocks

Enterprise Oil has signed two petroleum agreements on a production sharing basis with the Cambodian government to explore two blocks offshore Cambodia. They are the first contracts for petroleum exploration and production signed between the Cambodian government and foreign oil companies for almost two decades.

Enterprise will have a 60 percent interest in Blocks I and II, as operator, with its partner, Compagnie Européene des Pétroles having the remaining 40 percent interest in the blocks.

Each block covers approximately 5,000 square kilometres about 150 kilometres south-west of the port of Kompong Som.

Dunbar award

Total Oil Marine (TOM) has awarded a contract for the detailed engineering of the Dunbar platform and its associated facilities to Matthew Hall Engineering.

The detailed engineering contract, scheduled to last until February 1993, will be for a four-legged lifted jacket weighing some 9,500 tonnes with an integrated topside deck of 9,500 tonnes. Drilling will be tender assisted.

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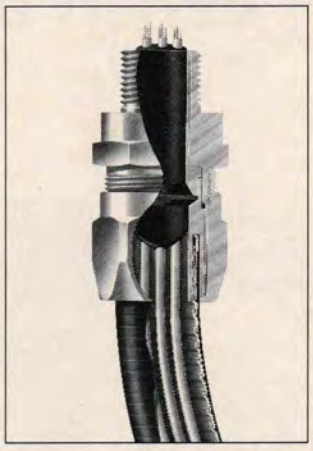

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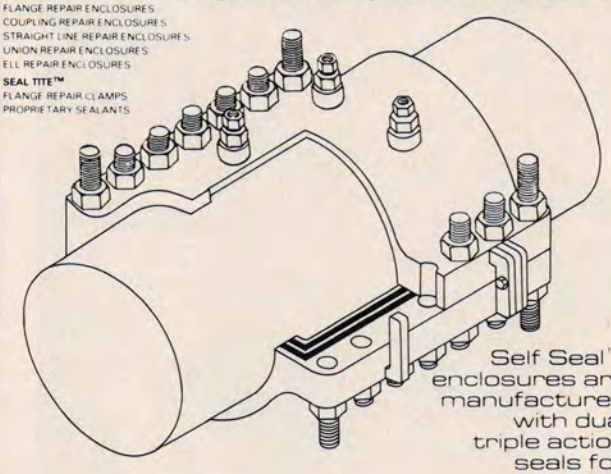

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Monday 11 November 1991

Hon Colin Moynihan MP

Parliamentary Under Secretary of State for Energy

will be speaking on

Conservative Party policy on energy and related environmental aspects

The meeting will begin at 4.30pm;
tea available from 4.00pm

For further details please contact **Mrs Pauline Ashby.** The Institute of Petroleum, 61 New Cavendish Street, London W1M 8AR. Tel: **(071) 636 1004.**

Ted Williams retires

Ted Williams retired from the Institute of Petroleum at the end of September after five years as Director General.

He was appointed to the post in 1986 when Council decided that the Institute should have a full-time Director General. His IP position followed more than 25 years with BP, which included lengthy spells with BP Chemicals and in Tokyo as Managing Director of BP Far East.

As IP President Basil Butler said at his farewell party at the IP on 27 September, attended by many of his friends and colleagues, 'It was not an easy job because he had to create the job from nothing. Moreover he had to cope with the ever-changing population of the Institute — staff, council and president'. In fact, Mr Williams had stayed on longer than he planned specifically to help Mr Butler in the early part of his two-year period in office as IP President.

Mr Butler said that the Institute had made 'enormous' progress in all fields over the last five years. This was a tremendous achievement which could be attributed to the leadership and inspiration of the Director General.

Mr Williams was presented with a watercolour of Knole Park by Frank Lucas as a memento of his time at the IP. In his speech of thanks, he paid tribute to the support he had received from many quarters — from the IP's small but energetic staff, from individual officers and committee members, from the IP branches, from many in industry and govern-

IP President Mr Basil Butler, OBE presenting Mr Williams with a watercolour of Knole Park. (R-L).

Mr Tom Radford, Senior Petroleum Engineer, Barclays Bank Plc and Chairman, IP Energy Economics Committee; Lt.Col. Curly Cail, Independent Tank Storage Association; Mr Pat O'Connell, former Technical Officer at the IP and Mr Peter Ellis Jones, Director, Tawe Oil Managements Ltd and a Vice President of the IP. (L-R)

Mr Williams, centre, and his wife Kay with Mr Basil Butler.

Mr Ian Ward, centre, the new IP Director General with his wife Beryl and Mr Charles Smith, Managing Director, Chevron UK Ltd.

Mr Dick Dasent, Managing Director, Repsol (UK), Mr David Clayman, Managing Director, Esso UK and Mr Viv Thomas, Chief Executive, BP Oil Ltd. (L-R)

ment. This help and encouragement had enabled the IP to be more 'visible', to carry out more work and become a more valuable organisation.

He had enjoyed his job at the IP and would miss various things after he left — including sundry odd features of office life in New Cavendish Street and the smiling crowds on the Victoria Line. In future he would be devoting his energies to golf, gardening and his villa in Spain, with encouragement from his wife, Kay, who was also present.

However, his links with the IP have not yet been totally severed. During his 'retirement', he plans to work in a consultative capacity on a few important subjects that he did not find time to investigate on a sustained basis while he was running the Institute.

He plans to update and streamline the IP constitution, which was originally drawn up in 1917. It is now generally agreed that its rigid framework could and should be made more workable and more appropriate for an important institution facing the challenges of the 1990s and beyond. Legal advice will have to be obtained on the ways and means of achieving such changes, especially in view of the IP's status as a charity.

In addition, he plans to continue to serve on one or two committees, particularly in the upstream areas. He will also remain the UK representative on the Board and Programme Committee of World Petroleum Congresses for another three year cycle, following the Buenos Aires Congress which he attended last month.

The question is 'Will he find time for golf?'

Diesel particulate analysis — formation of IP ST-G-10

By Diane Hall, BP Research

The subject of pollution has been of concern for many years, with environmental considerations governing more and more the amount of noxious substances that can be released into the atmosphere from every type of industrial process. Atmospheric pollution precedes the automobile, but because of the concentration of motor vehicles in city areas, the problem has been accentuated, with automobile exhausts contributing half the atmospheric pollutants in large cities and even more in those cities with atmospheres that are conducive to smog formation.

Car exhaust emissions have always been an emotive issue. They are, perhaps, one of the most obvious types of pollution to the man in the street. Anyone crossing behind a car turning out of a road, or sitting in a traffic queue behind a bus will be very well aware of the unpleasant nature of exhaust emissions. As far back as the 1960s US Federal and State legislation required the installation of controls on automotive vehicles to restrict the emission of pollutants.

Gaseous emissions were the first to come under control, with legislation set up to cover carbon monoxide (CO), hydrocarbons (HC) and oxides of nitrogen (NO_x). This legislation covered all automotive transport and did not differentiate between gasoline and diesel. This was to change however. It was apparent that diesel exhaust emissions were very different from gasoline. Although diesel CO and HC emissions were lower than legislation limits, diesels emit high levels of NO_x and also have a new problem — the diesel particulate, which for a long time had no legislation governing the amount that could be emitted. In the 1980s the first target for an allowable weight of particulate collected over a recognised test cycle was defined, with particulate emission levels becoming regulated in January 1988 in the United States.

Diesel emissions

Why is diesel exhaust so different from gasoline? Primarily, the diesel combustion process is extremely efficient ensuring nearly complete conversion of the hydrocarbon fuel to carbon dioxide and water, thereby explaining why CO and HC emission levels for diesel are so much lower.

Diane Hall

Unfortunately, because the diesel fuel is combusted in a large excess of air the NO_x emissions tend to be high (although not necessarily higher than gasoline). NO_x in the diesel exhaust originates from two sources: firstly, oxidation of the fuel nitrogen, which is a small contributor, and secondly, oxidation of the nitrogen in the combustion air. The extent of this latter reaction depends on the temperature and residence time in the engine. However, to cut NO_x by reducing the temperature and residence time (ie by changing the injection timing) would result in incomplete combustion with a subsequent rise in particulate.

Particulates

Particulate is formed when a proportion of the fuel (approximately 0.2 percent) combusts incompletely and produces carbon. Particles of carbon/soot are emitted along with the exhaust and are a major cause of concern. By placing a filter in the exhaust stream of an engine, these particulates can be trapped and analysed. Particulate is defined as all solid or liquid matter that collects on a specified filter in an exhaust stream diluted by air at temperatures less than or equal to 52°C.

The particulate is environmentally unfriendly. Owing to its composition, it is sticky and acidic and will discolour buildings and start corrosion. The size of the particle (0.1 μm–1.0 μm) means that it falls into the range that can be inhaled. Once inside the lung it may lodge, giving rise to health problems, which will be referred to later.

So, the two main problems for the diesel are NO_x and particulates. As mentioned, the two are related and although NO_x can be improved at the expense of the particulate, legislation is intent on reducing both. **Figures 1 and 2** show future legislation (both Federal and European).

Up until now, increased tightening of legislation has been met by change in engine design ie intercooling, turbocharging which have been effective in reducing both NO_x and particulate

Emission	1989	1990	1991	1994
		(g/bhp-hour)		
Hydrocarbons (HC)	1.3	1.3	1.3	1.3
Carbon monoxide (CO)	15.5	15.5	15.5	15.5
Oxides of nitrogen (NO_x)	10.7	6.0	5.0	5.0
Particulates	0.6	0.6	*0.25	0.1
*0.1 for buses				

Figure 1: US heavy duty diesel exhaust emission limits

Emission	Current limits	Stage II 1992	Stage III 1996
		g/Kwh	
Hydrocarbons (HC)	2.4	1.1	1.1
Carbon monoxide (CO)	11.2	4.5	4.0
Oxides of nitrogen (NO_x)	14.4	8.0	7.0
Particulates	—	0.36	0.15

Figure 2: European heavy duty diesel exhaust emission limits

levels. Future US legislation limits cannot always be met by existing technology and with the diesel engine this has indeed happened. In order to meet the new specifications, especially for the US 1994 limits, actual engine technology must be improved to design an engine capable of producing these emission levels, without sacrificing the performance, fuel consumption and durability/reliability that is associated with the diesel engine. This is shown schematically in **Figure 3**.

This does not mean, however, that others (especially fuel producers) can be complacent. Fuel effects, primarily cetane number, may have some bearing on the level of NO_x that is emitted but can have quite a substantial effect on the level and composition of the particulate. Individual changes in engine or fuel technology may only make small reductions to emission levels but to be able to assess these and so predict the path for future development, it is important to know more about the nature of the particulate and how individual fuel parameters affect it. Legislation only governs the weight of particulate emitted over a specified test cycle but with a detailed knowledge of the component parts of the particulate, it may be possible to reduce the total mass by influencing one of the components.

Particulate composition

A representation of diesel exhaust particulate composition is shown in **Figure 4**. Firstly, there is the inorganic carbon fraction (soot) which as already mentioned results from incomplete combustion. This carbon is highly active and acts as a nucleus for adsorbing other species present in the exhaust. Secondly, there is the soluble organic fraction (SOF) which is the name given to that part of the particulate that can be solvent extracted, usually with toluene or dichloromethane. The origins of the hydrocarbons that make up the SOF are varied. The majority originates from unburned fuel and lubricant but there are contributions from pyrolysis products and partial oxidation products. Among the higher molecular weight hydrocarbons that are present are 4–6 ring aromatic species, the polycyclic aromatic hydrocarbons (PAH), some of which have a known carcinogenicity. It is partly because of these that health concerns have arisen.

Another important fraction is the sulphate. This originates from the combustion of fuel sulphur to SO_2 which will undergo further oxidation to SO_3 and combine with water in the exhaust to produce sulphuric acid. To a certain extent, the sulphate measured is an artefact of the method of collection, with the amount collected varying with the type of filter used. This sulphate has bound water associated with it which contributes a measurable weight. It has been postulated that the presence of sulphate on the particulate will attract hydrocarbons from the gaseous phase, thereby having a greater effect on weight than would be expected by the sulphate alone.

Other small contributions are made from nitrate (formed by a similar mechanism to the sulphate) and metal oxides and sulphates which may originate as combustion products of the lube oil additive package.

The composition of the particulate will vary depending on the engine condition. At idle, when the engine has no load on it, the particulate has a high proportion of unburned fuel and very little soot. This situation is reversed at high load where temperatures increase and more soot is formed, with a corresponding reduction in SOF.

As more and more attention has become focused on the amount and composition of particulates and how reductions can be obtained, so fuel effects have become important and the need to develop a low emission fuel a priority.

Testing

In October 1988, CONCAWE set up a 'Diesel Emission Task Force' (STF-7),

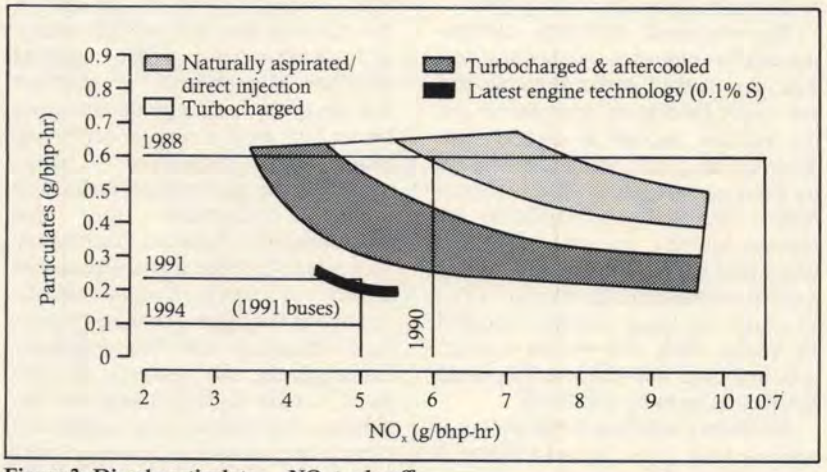

Figure 3: Diesel particulate — NO_x trade-off

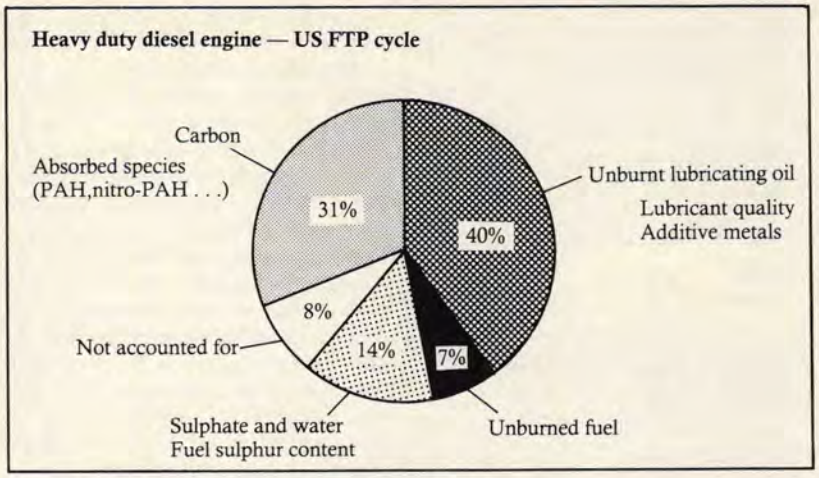

Figure 4: Composition of diesel exhaust particulate

to investigate fuel effects on particulates. The first aim was to investigate how much the reduction of fuel sulphur content reduced particulate levels in both light and heavy duty diesel engines. Consequently, six oil companies (from all over Europe) took part in a controlled exercise to measure emissions, both gaseous and particulate from four identical fuels with sulphur contents ranging from 0.05 to 0.3 percent.

Good agreement was obtained interlaboratory with gaseous emissions. However, it became apparent, from very early stages, that no definitive methods of test existed for the chemical analysis of the filter paper containing the particulate. Indeed, some laboratories had not even attempted this type of analysis previously. A suggested sequential scheme of analysis, based on existing techniques, was issued which enabled all the major components of the particulate (as previously described) to be measured from a single filter paper.

The analytical problems encountered in this type of work are immense. The quantities of particulate collected are small (milligram quantities) and the analysis needed is diverse. Sulphate on the particulate is determined by ion chromatography on an aqueous extract. The SOF is measured by gas chromatography analysis, in some cases with the SOF being removed by solvent extraction prior to analysis and in others by being directly desorbed thermally. This also allows a rough split into 'fuel' and 'lube' boiling range hydrocarbons to be calculated.

As already mentioned, the chemical species that give the particulate a potential health concern are the polycyclic aromatic hydrocarbons. The species that give most cause for concern are the 4-6 ring PAHs — of which there are a large variety, although not all are considered carcinogenic.

At the normal filter loading, individual PAHs are only present at nanogram quantities. The analytical procedures needed to separate and measure them are very complicated and difficult. However a wide range of PAHs can be detected using varying chromatographic techniques.

The results from this initial CONCAWE trial highlighted the difficulties that the individual analytical requirements presented to the laboratories. Consequently, filters that had been generated under identical conditions were circulated to each laboratory for subsequent analysis. Quite good agreement was obtained for the total SOF as measured by gas chromatography, although the method of extracting it from the paper was found to vary. However, the split of this fraction into fuel and lube range hydrocarbons gave widely varying answers. Measurement of sulphate was generally very reproducible from lab to lab, with a similar technique being used throughout. Carbon measurement was very different. The recognised method for this measurement is Thermal Gravimetric Analysis (TGA) but it is accepted that at very low levels (<4 mg) the results become meaningless, because of practical difficulties with the technique. Consequently, the amount of inorganic carbon is determined by difference, which when one considers the complicated analytical procedures that have been employed to give the answers for the other portions of the particulate, is less than satisfactory.

These results were the outcome of only six labs' endeavours. It was uncertain if the different answers originated from a genuine variation in the analytical techniques being used or were associated with the difficulty in removing the separate portions from the filter. It was obvious that there were many other parties in Europe involved in similar work both in assessing engine developments and fuel improvements and that it was highly likely that they were developing or had already developed methods of analysis along similar lines to those already being explored by CONCAWE. At this time it was felt that it would be appropriate to try and bring the methods of analysis together with an aim of preparing standard methods of test. Consequently the Institute of Petroleum was asked to take this area under its wing.

Formation of IP ST-G-10

An initial letter in September 1990 was sent to engine manufacturers and research labs across Europe, requesting participants' interest in setting up a task force for the investigation and standardisation of the analysis. The response was very encouraging and consequently a questionnaire and an invitation to an inaugural meeting were sent out for a meeting in November. I think it is fair to say that the attendance at this inaugural meeting was surprising, with 27 people from all over Europe not only attending but offering practical assistance. From this inaugural meeting, three groups were formed: a steering group, an organic and an inorganic sub-group. Meetings of all groups have taken place since and a round-robin exercise initiated for primary investigations into the organic analysis of the filter. Twelve labs took part, five of which are from outside the United Kingdom. From the results of this round-robin, a second has already been started, this time with participation from 22 different centres. It is hoped that methods for diesel particulate analysis will be in place within three years.

Any other parties who are interested either in participating or in receiving minutes are invited to contact either the author (Secretary of ST-G-10) or Mr PR Shore (Chairman of ST-G-10), Ricardo Consulting Engineers, Bridge Works, Shoreham-by-Sea, West Sussex, or Mr John Phipps at the IP. ■

OFT Gas Review: paying homage to competition

By Irene Himona and John Toalster
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The Office of Fair Trading review of the UK gas market which was published in October 1991, expresses serious concern about a number of features of the current market structure, which in the OFT's view severely limit the scope for competition. British Gas is accused of exploiting its size and dominant position by unfair market practices. Hence, the OFT is making a number of proposals for action, which amount to a complete restructuring of the UK gas industry.

The proposals are potentially very radical. Hence it appears that the three month time frame envisaged by the OFT for initial agreement to be reached with British Gas on these issues, is both unrealistic and unfair. The vision of a competitive gas market in the UK not only contradicts the one apparently prevailing five years ago at the time of privatisation, but also raises fundamental questions about how wise the whole idea of regulated privatised utilities has been.

Background

Privatisation: The UK gas industry is currently in a complete imbroglio, which goes back to what obviously the government recognises as a mistake, namely, the privatisation of British Gas in 1986 as a monolith. Clearly, had the company been broken up into its regional components, with the pipeline system separated out, then it is just conceivable that the UK gas industry — that is, British Gas — would today be free to run its business efficiently, without having to devote huge amounts of management time anticipating and responding to the OFT or MMC.

However, in 1986 the industry's structure was clearly not an issue, despite the claim that the aim of privatisation was to raise efficiency by introducing competition, since the monopoly was maintained largely intact. The main objective of the government five years ago was simply to transfer the ownership from the state to the public and to raise cash, whilst at the same time placating British Gas by a 'good sendoff'.

The 'good sendoff' incorporated the maintenance of the company's structure intact. It also included the favourable 'RPI2 percent' tariff formula enabling substantial profits to be earned and the high, 25,000 therm per annum threshold between the tariff market (in which BG possesses a guaranteed monopoly position, despite the fact that average domestic consumption is only 630 therms per annum) and the contract gas market. The aim was obviously to make it as attractive as possible for investors at the time, but the scene was also set for subsequent wide ranging changes.

The MMC reference: The trouble began a year after privatisation, in November 1987, when the Director General of Fair Trading referred to the Monopolies and Mergers' Commission the supply of gas to contract customers — those industrial and commercial customers consuming more than 25,000 therms annually. The MMC investigation took a year to complete and concluded that the existence of a monopoly in the contract gas market resulted in price discrimination, which operated against the public interest.

It seems reasonable to suggest that, not only is this intuitively obvious, but there is a possibility that if consumers were being exploited by a privatised monopoly in 1987–88, then they were presumably also being exploited to a degree by the same monopoly, when it was in state hands prior to the 1986 flotation. Nevertheless, apparently consumers' interests became a concern only after change in ownership was effected!

Onset of competition: The MMC made a number of recommendations in 1988 — and British Gas signed appropriate undertakings — aimed at creating competition in the contract gas market. The main proposal was that North Sea gas supplies should be made more freely available to non BG companies — the 90/10 rule, whereby BG was prevented from purchasing more than 90 percent of the gas on offer from new fields in the UKCS, between June 1989 and June 1991.

Moreover, to ensure that once potential competitors had access to gas supplies, they could deliver the gas to the consumer, BG signed an undertaking about the provision of common carriage. Finally, the MMC recommended the introduction of non-discriminatory price schedules for firm and interruptible contract customers. The DTI announced in April 1989 that a review should take place in July 1991 on the effectiveness of the remedies applied after the MMC investigation, hence the recently published OFT review.

OFT review of gas: the conclusions

The investigation had two main objectives: firstly, to examine the extent to which BG has complied with the MMC requirements and secondly, to find out whether these remedies have stimulated competition in the UK con-

tract market. As far as BG's compliance is concerned, the company was given a clean bill of health, having complied fully with all the recommendations and with its undertakings — namely, the 90/10 rule and common carriage, as well as on the price schedules introduced for both firm and interruptible gas customers.

On the effectiveness of these remedies in fostering competition, the conclusion depends in part on how one defines the contract gas market. Excluding the gas swaps introduced by BG, the share of non-BG companies in newly contracted gas is 35 percent, that is, three and a half times higher than the level required by the 90/10 rule. This represents an over-achievement by any standard.

However, according to the OFT, an important 'unforeseen development' has affected the demand for new gas supplies — unforeseen by the MMC, that is — and this is the demand for gas to be used in power generation. As a result of the emergence of this new source of consumption — which, despite constituting a component of the contract gas market segment, is not recognised by the OFT as competition to BG — during the first year of monitoring, 99.5 percent of newly contracted gas was destined for power generation, falling to a still substantial 85 percent during the second year.

The unfair decision to remove the gas destined for the power generation market led to the OFT finding that only 5 percent of newly contracted gas was in fact destined for the industrial and commercial contract market, which is judged as inadequate to foster meaningful, sustainable competition. Moreover, the OFT estimates that the possible share of the non power generation contract gas market which can be supplied by non-BG companies, reaches a peak of only 8 percent in 1992. Thus, the OFT's basic conclusion is that the remedies introduced by the MMC were ineffective in fostering competition and this has to be seen as an indictment of the MMC.

The proposed remedies

Although the OFT review has focused on the effectiveness of the BG undertakings after the MMC inquiry, nevertheless the investigation resulted in a number of findings which led the OFT to indicate the type of change that would, in its view, foster sustainable competition. Competition in the commercial and industrial market was found to be limited by three factors: firstly, the lack of gas availability to potential competitors before 1995; secondly, the inability of BG's competitors to balance supply to demand, effectively due to lack of storage and transmission facilities, as well as seasonal swing gas fields; and finally, discriminatory practices by BG.

The remedies proposed on gas availability include gas imports — quite a change of mind compared with the rejection in 1985 of imports — as well as the release of gas by BG — which should not be swap gas, because this is repayable. To achieve Ofgas' target of a 30 percent market share for competitors in the contract market by 1993 and given the very long lead times in developing gas fields, the only available route envisaged by the OFT is for BG to transfer the ownership of the gas it possesses under contract to its competitors; this could take place via auction. Furthermore, the 90/10 undertaking which has now expired should be replaced by an undertaking by BG that it contracts for no more new gas than the quantity necessary to allow competition to flourish.

Moreover, competition is dependent on the appropriate portfolio of gas supplies being available, such that variable demands can be met, and this would need to include high swing fields — those with a high degree of variability of production. BG's competitors were unable to satisfy variable gas demand, because of their very narrow supply sources as well as lack of storage facilities, which makes it impossible for them to enter the interruptible gas market, according to the OFT.

Interruptibility is a key requirement for meeting peak demand and clearly, if potential competitors possessed the ability to meet peak demand from firm contract customers, then their entry into the contract market would be facilitated. The OFT suggests that this problem could be tackled by forming a separate subsidiary to include BG's transmission, distribution and storage system, which ideally should be divested from BG, in order to avoid the need for regulation of the charges.

Additionally, the OFT recommends the abolition of the 25,000 therm tariff threshold, which would facilitate competition in general and would necessitate a change in primary legislation. Until this is effected, BG would be required to give an undertaking not to use the power conferred on it under the Gas Act to object to competitors wishing to enter the tariff market. Recommendations are also made on the need to modify the planning procedures for new pipelines, which at the moment discriminate in BG's favour, as well as to strengthen the powers of the Director General of Gas Supply.

An assessment

One cannot help but regret the fact that the government changed its mind regarding the appropriate gas market structure after, rather than before, the flotation. Indeed it is a staggering change of view, given the in-depth review carried out in 1984/85 on behalf of the government, of BG's efficiency, which concluded that the monopoly did not operate against the public interest.

Nevertheless, the change did occur and the result has been creeping regulation. The government's current intentions for the UK gas industry appear to be to abolish the BG monopoly and eventually introduce sustainable competition across all gas market segments, although it is not clear exactly how competitive the market should be, or what market share BG will ultimately be forced to concede.

Furthermore, the precise form and length of the route leading to this competitive ideal is also unclear. The OFT report raises many questions not only about the transition mechanism, which is likely to be messy, but also about the desired, final market structure.

One cannot avoid asking whether the competitive model is necessarily the best. The theory appears to be sound, since competition is meant to bring with it lower prices for the consumer. But the 'RPI2' formula has already lowered real gas prices to British consumers, whilst under 'RPI5 percent' real prices will fall even further after 1992.

The US gas market may be used as a model, with its very low prices, but such low prices have more to do with lack of demand due to unreliability and safety problems, which have led to loss of market share for gas — something that, fortunately, the United Kingdom has not experienced, given BG's excellent safety record. The reputation of gas in terms of safety, security of supply and price volatility is extremely variable worldwide. It would be utter folly for the United Kingdom to sacrifise safety and reliability in the pursuit of competition.

Neither can one help but wonder whether the OFT's suggestion of a complete abolition of BG's tariff monopoly should be interpreted as, essentially, an admission of failure of the whole idea of regulated, monopolistic utilities. After all, looking at the electricity industry's structure, apart from separation of the generation side, the biggest part of the industry has re-

mained intact — the regional boards — so it is not clear that any competition necessarily will be forthcoming. This makes it purely a question of time before regulation starts creeping up in this industry as well.

Developments in the gas market after privatisation appear to be shaping up into a typical British compromise. The state-owned monopoly was ruled out in 1986. The privatised, regulated monopoly appears increasingly to be a rejected option, although exactly what form its replacement should take is still open to debate. Certainly, competition is the current fashion and perceived panacea, but it would be unreasonable to expect a truly free market to emerge — they do not really exist. Although it would be reasonable to expect that BG's dominance will be eroded over time, nevertheless, it is likely to remain the predominant player for many years to come.

As far as BG's future direction and source of earnings are concerned, the company's success in penetrating the UK market has been so great, that it led to the onset of maturity; hence, to maintain earnings growth in the 1990s, the company embarked on a diversification strategy as soon as it was privatised. As it turned out, with creeping regulation this was the appropriate strategy and the current uncertainty will undoubtedly accelerate this trend, helped by the proceeds from any divestments forced upon BG — be it gas contracts or the pipeline system.

Uncertainty is bad news for any business, however, and it is unfortunate that all that has been achieved post privatisation, is continuous turmoil and ongoing interference. The aim from now on should be to take and implement the decisions that are right for the industry quickly, for the benefit of all — consumers, investors, potential competitors, British Gas and the UK gas industry at large. After all, it is the future of the UK gas industry which is at stake. Indeed, it is sad that one cannot think of any country which has both the proposed competitive model with its consequent very low prices, and a really successful, safe and secure gas industry. ■

'We just carried on with our business'

In an interview with Petroleum Review, Brian Stanley, Managing Director of Kuwait Petroleum (GB), reviews the period since the invasion of Kuwait 15 months ago. He describes how the company successfully kept its UK business operating normally and elaborates on the expansion currently in hand and planned. He comments briefly on the long-term strategy of the parent companies in Kuwait and gives an update on the reconstruction of the Kuwaiti oil industry.

The different concepts for the Q8 and Pace brands are explained and he comments on the long-term prospects for small-volume rural sites.

Carol Reader: Are Kuwait Petroleum (GB) operations back to normal after last year's upheaval?

Brian Stanley: I think that we'd like to feel that they were never anything other than normal. Obviously there was a lot of work that we had to do internally with the Bank of England and Department of Trade and Industry and others but as far as the customers were concerned, they really saw no effect. All the feedback that we have received has been very positive — whenever they wanted their product they got it, on time and without any problems.

Our main focus was to continue supplying our customers. In fact in many cases I think we've gained long-term customers who were pleased with the service that they got during that period of time.

Obviously it was fairly critical in other areas like suppliers, suppliers of all sorts of goods and services, but with one notable exception of a major company which we finally got over, everybody else supported us fantastically.

Afterwards we wrote to every supplier and all our customers and said thank you very much for supporting us. I've talked to customers who have said that they were most impressed with the way thinks kept running smoothly during that period of time.

What's the supply position now for your refineries in Europe?

We've got three refineries in Europe — one in Denmark, one in Rotterdam, one in Naples. With the invasion of Kuwait, we entered into a purchase contract with the Saudi Arabians for crude oil supplies, which you may remember. That is actually running at a slightly lower level now than it was before but all our refineries continue to run at full capacity in Europe.

They are providing all the products we need, though we are purchasing on the outside as well — we were purchasing previously and we continue to purchase to make up the requirement. What we are doing is purchasing to make up the shortfall on what we were previously receiving as finished products from Kuwait. We've had a lot of internal activity to get the right products and so on in place but we are now mixing, refining and purchasing on the most economical basis available to us.

Are you still planning to expand your business in this country?

Yes, we've carried on expanding over the last year or so. We've acquired a storage terminal in Kings Lynn; we acquired a company called Kamper Services which was a service station chain in East Anglia which had about 20 sites, there were some that were due for re-development. We have acquired a couple of other businesses, other individual petrol station sites. We've taken on a business which is involved with five sites around London refuelling taxis which are associated with the railway stations.

We have also carried on expanding throughout Europe. Last year we acquired Mobil's operation in Italy, literally just before the invasion. We've set up a new operation in Hungary.

You have two brands — Q8 and Pace. How do you differentiate between the two?

We look at them as two specific brands, and everything that brand means in modern retailing practice. They are not just convenient labels. We use the Pace brand for the smaller sites which carry out many other activities on the site rather than just selling petrol — a workshop, car repairs. It's more of a service concept through our distributor network, it is for the people who want a quick local service for the delivery of their fuel.

But they are not at the other part of the spectrum which is where we position the Q8 brand, the full modern service station concept, which is dedicated solely to the motorist — with a good range of products. It will have leaded, unleaded, super unleaded and diesel fuel. It will have a car wash; it will have an extensive shop; it will probably have some form of catering facility like coffee machines, snacks, sandwiches, chiller cabinets and all the other kinds of things. But no workshop or anything like that.

Those sites are being constructed to be the equal of anything that you will find in the United Kingdom these days.

Is it a question of volume?

Yes, by definition because the sites which are Pace-branded are probably small sites with small tanks, and which probably cannot take full-load tankers, so they need frequent smaller deliveries and want to be able to get it when they need it. We undertake to deliver within 48 hours of receipt of order generally

across the network. But the Pace brand is for people who require the slightly different type of service, local service.

Are the small volume rural sites vulnerable? Are some likely to get closed?

I think that they are all vulnerable, simply because of the shift that is happening in petrol retailing. What we hope we are doing by providing the Pace concept is keeping them alive longer. I hate to talk about keeping any business 'alive' but we must realise that it is under threat. There are certain types of site that any company would find it hard to justify the kind of expense which is typically involved in a larger dealer site. In other words, you are looking for more extensive facilities, more comprehensive branding on the site, dealers probably looking for advice and training in retailing skills etc. We provide all of this to those sites where the economics are right but there are other sites, where anybody, not just us, will find it is very difficult to just make the economics stack up. Those sites may find themselves left out in the cold a bit, left to their own devices. What we are trying to do through the Pace concept is to say 'Here is a way of actually providing a service that is needed by those people' of the type that they actually need and hence enabling them to carry on in business.

We are actually gaining sites for Pace. People are coming along saying that they like the concept; they don't want all of this other stuff but do want quick service in terms of delivery.

What proportion of your service stations have forecourt shops?

Of the ones that we own they virtually all have forecourt shops. This is a programme that we are expanding. Wherever we reconstruct, obviously we put in a suitable sized shop. In five cases we have what we call C Stores — quite large, almost convenience size stores with very large shop areas. But virtually every site that we construct these days will probably have 50–80 square metres of shop space, depending on its location and the type of facilities that we are trying to provide. There is a lot of walk-in business these days in service stations and if you are in an urban area it provides the kind of facilities that the village or corner shop used to provide and maybe does not any longer. The benefit is that in many cases it may be open 24 hours, or certainly say 6 am to 11 pm.

On open road sites we will change the mix a bit — there will be less in the way of grocery goods but more in the way of things for the long-distance traveller — sandwiches, snacks, hot food vending etc. In fact in our latest site we've actually got a couple of tables and chairs inside the shop so that people can sit down and eat their snacks in comfort rather than having to sit in the car.

Brian Stanley

How successful is your International Diesel Service?

That's very successful. The concept is truly international and it runs from northern Scandinavia, Sweden and Denmark all the way down through Italy, France and Spain, Germany and throughout the United Kingdom. There are some areas where we need to expand it; it's just coming into operation in Spain; we need more sites in France which are coming along, and some more sites in Germany which are coming along. Then we need to extend into Eastern Europe. But otherwise the network is very well established.

The philosophy is that no site will be more than four hours drive away from the next. In this country we now have 37 sites, which means some of them are much much closer than that.

The big plus is that it is the only true international network which is card-based with a security system on it. Each card has an individual pin-number, so it can only be used by the person who knows the pin-number. It means that obviously the operator of the trucking company has security — he also knows in advance how much his fuel is going to cost him in each of the countries — drivers are not going out with bundles of notes of Lira and Pesetas and Francs and so on and having to make their own way in terms of finding their fuel. They know exactly where the places are. They know they will be open 24 hours, 7 days a week, 365 days a year.

Do they have accommodation?

Some do and some don't. It depends on whether they are tied with a truck centre. There is a range of facilities. Some may just be fuel, maybe toilets and telephone facilities. There may be truck repair facilities, tyre replacement, while some have full accommodation and restaurants.

Do they require big sites?

Not necessarily. It depends on whether or not you are going to provide parking but some of them are literally on the road, fill up with diesel and then keep going. Truck drivers have their chosen places where they like to go and stop, where they like to eat. We find in many places that you could provide those kind of facilities but there is a particular restaurant, cafe or stopping-

place that they all know of and like to gather. So what ever facilities you provide they may bypass it and go on somewhere else.

The fundamental thing is the truly international, secure fuelling system. Where we see the benefit of some of the other facilities then they probably exist but we are not trying to be side-tracked to be hoteliers or caterers.

What is your company doing to achieve a 'green' image in retailing?
I think that we have to claim that we were the first company in Europe to introduce unleaded fuel back in 1985 — and to introduce it widely across Europe.

Then about three years ago we introduced our clean-blend diesel, which is diesel with an additive package, which means that there is no smell to the diesel, it has an odour-masker, it burns cleaner and it doesn't have any foaming so you don't get any splash-back when you are filling up. This is for the private motorists on retail sites.

We are obviously paying a lot of attention to things like health, safety and environment. We have appointed a health-safety and environment manager one of whose prime responsibilities over the last few months was obtaining our BS5750 Part II Qualification of Distribution Activities. We have achieved that qualification over the last few months — that was going on at the time that the invasion of Kuwait took place.

Wherever we rebuild a service station now, we are obviously putting in stage one vapour recovery. Many of the sites now have water-recycling plants for their car-washes. There is quite a wide range of things we are involved in. Obviously it's one of the big issues at the moment — it is not just an image, it is an essential part of the operation.

Recently at Merstham near Redhill we have rebuilt a site that actually consisted of a row of 200-year-old cottages in a very environmentally sensitive area. They were being used as a workshop at the back but from the other side they were listed buildings. We've completely re-developed the site, preserving the whole of the row of cottages, rebuilding the roof, rebuilding all the walls and the chimney-stacks and everything else. It was a major expense to make the whole thing blend in with a very environmentally sensitive area. On the one side it looks just like a row of 18th century cottages. On the other side and built into the back is actually a brand-new service station with a shop.

Kuwait update

Present crude production is 260,000 barrels per day (b/d). This will rise to 400,000 b/d by the end of the year and it is hoped to produce 800,000 b/d by next June (down from the previous capacity of 2 million b/d).

Number of wells capped so far is 500 (excluding the Neutral Zone area). At the present rate of capping, which is 100 wells per month, the company expects all fires to be put out at the latest by first quarter of next year.

At present, there is one refinery, Mina al-Ahmadi, partially operational at 170,000 b/d (down from its total capacity of 400,000 b/d). A second refinery is expected to start up on a partial basis at the end of the year. However, in view of the severe damage to the overall refining capacity, it is unlikely that they will be fully operational (in their previous status) prior to end-1993.

The total oil infrastructure was severely damaged. Nothing was spared from demolition and sabotage:

- All three refineries were damaged, with Shuhaiba almost totally destroyed.
- Out of 1,551 wells (including the Neutral Zone), 825 wells had explosives attached of which 775 exploded, leaving the balance with charges still on them.
- Out of seven pier facilities for export of oil, only one is currently operational.
- Out of 26 oil gathering centres, only three were left undamaged.
- Out of the 18 million barrels of crude oil tankage, only 4 million barrels were left operational.

The preliminary estimate of the damage to the oil sector is in the range of $15–17 billion to which has to be added to value and cost of the oil burning at the rate of 6 million b/d, valued at approximately $40 billion annually.

Is a UK refinery a long-term possibility?
It depends if one is for sale. We are always evaluating options in terms of expansion. Of the number of people who own UK refineries, many are unlikely to sell them. It depends what options come up in the future — whether others are either going to stay or not stay in the UK market. I doubt whether somebody would sell a refinery without selling the rest of their operations and network. Like in Italy when Mobil decided to get out, they obviously sold the whole marketing operation including the refinery.

Do you have similar expansion plans in other countries in Europe?
Well, we are always looking for the opportunities. We are constantly being presented with opportunities which consist of all sorts of petroleum assets on the downstream side.

Did you see a recent newspaper report that BP might go back into Kuwait?
I saw that too. I don't know anything about it — it's not our area. It is something that will be negotiated directly with the Kuwait government.

While I acknowledge that your responsibility is this country, do you think that what happened in Kuwait will change the long-term strategy of your parent companies?
I don't think so. I think that the rationale for Kuwait Petroleum going downstream which was conceived over 10 years ago was to be able to diversify its operations — to be able to reach more end-consumers in different countries and so be able to go up and down with booms or recessions in different countries, fluctuating exchange rates between the dollar and local currencies, the variability of different markets.

I think if anything the invasion last year actually endorsed the validity of that strategy, because if we hadn't had the operation in the United Kingdom, the operation in Scandinavia, in Benelux, Italy and worldwide, the company would have ceased to exist last year. But it carried on. We had the operation which literally was operating on 1, 2, 3 August and so on. We just carried on with our business; we still have all the customers that we had then, essentially, and the same thing applies in all of the other countries that we are operating in.

I think it's an endorsement of that downstream strategy and it shows how robust the organisation is, because I doubt whether there are many other oil companies that literally could have had their head offices wiped out at a stroke and then still carry on operating in the days and weeks that followed. I think that it is indicative of the way that the company is set up, that it could do that and carry on in that fashion. ■

An integrated 'off-the-shelf' SCADA system

By Mark Scruton

The use of 'off-the-shelf' computer technology is one of the key design features behind a new supervisory control and data acquisition system (SCADA) for one of the world's most complex multi-product pipelines.

One of the prime specifications of the contract for the Thames-Mersey pipeline control system, run by the British Pipeline Agency Ltd (BPA) was that the control system should be based on widely available standard computer software and hardware.

The basis of the contract was a comprehensive technical specification prepared by BPA's Engineering Division from extensive experience procuring pipeline SCADA systems. SD-Scicon won the contract by recommending, on the software side its proven SETCON SCADA software package, used in over 300 installations worldwide and, on the operating and network software side, the use of standard DEC products, VAX-VMS and DECnet-VAX.

The new SCADA system, which replaces two existing systems, one dating back to 1968, is now used by BPA's Operation Division to run the pipeline on behalf of United Kingdom Oil Pipelines Ltd (UKOP), a consortium of major oil companies comprising BP, Chevron, Mobil, Petrofina, Shell and Texaco.

The pipeline system carries refined white oil products from refineries on the Thames and the Mersey to distribution terminals around the country.

Work started on the new project in October 1988 and, after extensive factory testing, a 12 month installation period began in January 1990 at the Thames end.

The system, which has now been completely installed, controls the complex functions performed at the 24-hour central supervisory system at Kingsbury, Birmingham, and six systems at the principal sites along the pipelines.

Mr Dave Jarvie, Project Manager, BPA, said, 'We asked SD-Scicon to implement the system because we were confident the company had the technical expertise, proven software and experience to deliver the system we needed.'

Pipeline system

The pipeline systems consists of two pipelines, one from the Stanlow refinery on the Mersey with distribution terminals at Uttoxeter, Kingsbury, Northampton and Buncefield (Hemel Hempstead), the other from refineries and tank farms in the Thames Haven area with terminals at Buncefield, Northampton and Kingsbury.

Altogether the system's 470km of pipeline, with diameters ranging from 6 to 14 inch, transports a complex mixture of about 2,000 batches or parcels of fuel per year totalling over six million tonnes.

Different types of refined white petroleum products are pumped continuously through the system. There are eight different grades of product including motor spirits, aviation fuel, kerosene, diesel fuel and gas oils.

At certain stages mixtures of products are created when different parcels of products follow each other. Where these mixtures or interfaces occur can be identified. To keep the specifications of the products up to standard, monitors are used which measure the relative density and colour of products passing through the pipeline. Any interface mixtures of incompatible product can be spotted and removed into separate tankage. Compatible product interfaces are allowed to be absorbed into the lower grade product.

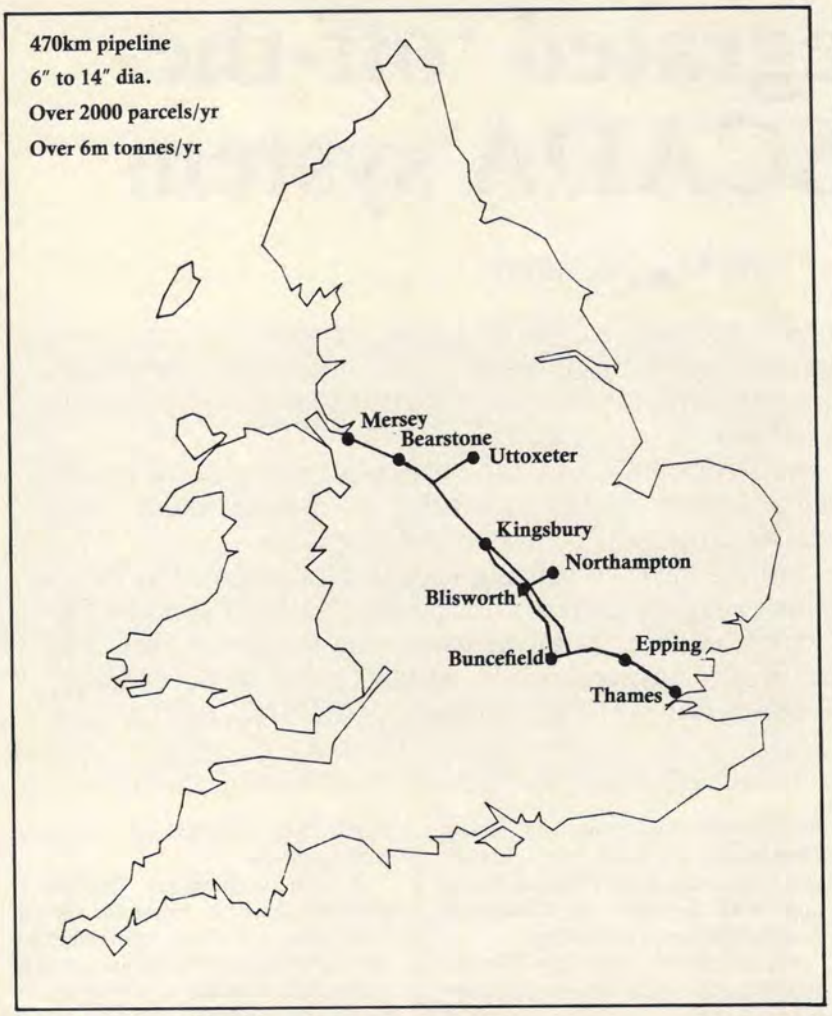
A monthly pumping schedule is prepared by BPA based on the oil companies' forecast requirements. This schedule is arranged in cycles of compatible products to minimise the number of interfaces.

Extensive instrumentation is used to monitor the pipeline system with pressure, temperature, flow, relative density and colour measurements amongst those transmitted to Kingsbury via the SCADA system.

Measurement of volumes of product pumped is particularly important for integrity monitoring and product accounting. Turbine meters at each pipeline input and output measure product volume. Each meter station is equipped with a sophisticated flow computer which corrects for temperature and product type.

An on-line prover at each meter station is used to ensure the accuracy of volume measurements. Proving cycles are started on product changes, temperature changes, flow rate changes, parcel changes and at regular intervals every two hours.

'The system integrates the pipeline's functions automatically'



General overview of UKOP multi-producer pipeline *Courtesy BPA*

Sophisticated

SCADA has come a long way since the early 1930s when operations were co-ordinated by hourly telephone calls from operators reading the pipeline pressures at different sites. Since then SCADA has become increasingly more sophisticated especially following the recent advances made by the electronic industry.

Apart from providing the operators with improved methods for monitoring and controlling the pipeline, the new system can also provide additional functions which can help BPA operators to carry out other tasks.

These tasks not only include traditional pipeline applications such as leak detection and batch tracking but also the full automation of all the operations associated with receiving, transporting and delivering batches of product.

Dr Neil Glendenning, SD-Scicon's project manager said: 'The system integrates the pipeline's functions automatically. For instance, it can send a particular product from A to B, automatically generate the appropriate accounting documentation and send these to the shippers.'

This automation has many advantages, not least being that the system is less error prone, especially as the full automation of most functions means there are less opportunities for human error.

Back-up systems

To ensure there is no machine error, two important design features were specified — a resilient communications network and extensive back-up and fallback systems.

These back-up systems go all the way down the line. The central system uses two Digital MicroVAX 3500s, connected in a 'hot' standby configuration, with IBM PS/2s as colour operator terminals. A 'hot' configuration means that while one MicroVAX 3500 is in use, the other one is continually updated in real-time with information from the network, so that it can instantly take over should something go wrong.

A further back-up is provided at each of the six local sites where a single MicroVAX II is used to handle the data. Here, data acquisition sub-systems, based on industrial IBM PCs and Allen-Bradley Input/Output (I/O) equipment, connect the control system to the plant and its monitoring instruments.

At each site there are also local panels, designed by BPA, which

Part of BPA's pipeline system

provide plant protection and control completely independently of the computer system — very useful if the whole of the computer system goes down. Signals from the panel are then sent to the Input/Output equipment so they can be read by the site's MicroVax II computer before being passed on to the main computer network.

The immense amount of data generated means the new system's computers must have the capacity to be able to update and store information as quickly as possible. For instance, the MicroVAX 3500s are so powerful they can react to changing events on the pipeline within seconds and each one alone can store the equivalent of 200,000 A4 sheets crammed with information.

This computing power is needed because at each location sensors generate literally hundreds of real-time monitoring signals. Altogether the package has to deal with over 5,000 digital and 2,000 analogue inputs and outputs from the pipeline's computer network.

'Each of the major sites has its own local panel and own computer system dealing with hundreds of signals from instruments. The system as a whole deals with thousands of signals,' said Dr Glendenning.

To ensure data integrity, the links between the different elements of the network also need to be robust enough to handle the transfer of data consistently and reliably. For this reason all the system's data are transmitted over integral private lines by modem on permanently-dedicated phone lines. Each private line is backed up by a dial-up phone-line. At Kingsbury the whole pipeline system can be viewed by displays on the operator's VDU terminals which have a variety of messages, colour screens and plant diagrams which the operator uses to monitor the pipeline system.

UKOP pipeline control system

operators have a high degree of access to data about the system and so enable pipeline operations to continue safely under a wide range of SCADA system fault conditions.

Additional software

However, such is the complexity of the operation of the Thames/Mersey pipeline that additional software had to be provided to allow operation of the pipeline at maximum efficiency.

This additional software was seen by BPA as a key feature of the new SCADA system. In order to ensure that BPA got exactly what they specified, they set up a BPA project office in SD-Scicon's offices in Milton Keynes. This move meant that the two teams could work closely together to develop the applications software. 'It was more of a partnership rather than the traditional supplier/vendor relationship.' said Dr Glendenning.

'It was more of a partnership rather than the traditional supplier/vendor relationship'

The operator terminal information is part of the SETCON package which performs the basic SCADA functions. These functions include maintaining the real-time database, alarm handling, generating the operator's terminal screen via colour display and plant mimics, historical data recording, report generation and logging. The combination of these features means

Advantages

This close co-operation ensured a smooth installation period and resulted in a package which provides: three types of leak detection, advice notes (or accounting documents showing the shipper where its products were sent), an automated schedule programme, a programmed route change mechanism, automatic parcel handling, parcel tracking and automation of many of the operations of the pipeline.

One of the many advantages of the system is that the data collected can now be used to check how the pipeline system and its monitors are functioning. The system can maintain trends over months of plant data by monitoring long-term pipeline performance. These trends can be used to detect potential instrument faults. This enchanced monitoring capability plays a key role in securing the continued high level of environmental performance of the pipeline.

Another innovation is the creation and transmission of advice notes. Now shippers are automatically told within seconds how much of their product has been sent through the pipeline and to what terminal. This not only reduces the workload on the BPA operator but considerably improves the invoicing system. ■

ASEAN gas grid under study

By William Scholes

A feasibility study for the proposed $US10 billion natural gas pipeline project to connect all six members of the Association of South East Asian Nations (ASEAN) will begin at the end of this year and be finalised within 18 months. The 4,950 miles of pipeline would connect Brunei, Indonesia, Malaysia, the Philippines, Singapore and Thailand. Finance for the $A4.3 million study is being obtained from the consortium of European companies interested in the project.

Since the pipeline proposal was first mooted 18 months ago, Indonesia's natural gas production, including gas stripped of liquids and re-injected into producing fields, totalled 2.2 trillion standard cubic feet (Tscf) in 1990, up over 9 percent from the previous year, a 7.5 percent average annual growth rate since 1981. Pertamina, the state-owned Indonesian petroleum corporation, expects this rate of growth to continue over the next five years to reach 2.9 Tscf in 1995.

Gas supply

Indonesia is the largest gas producer in the ASEAN region. Three PSC companies lifted about three-quarters of all the gas produced to supply the LNG/LPG complexes at Arun and Bontang. The giant maturing Arun field, operated by Mobil Oil (USA), produced 2.3 billion scf per day in 1990.

With 217 Tscf of estimated gas resources in place (67.5 Tscf proven reserves), future gas production now awaits a market such as the Trans-ASEAN pipeline grid could open up.

By far the largest development will be the Natuna field, located in the South China Sea, east of Natuna Island. This field contains an estimated 45 Tscf of commercial gas reserves but exploitation is hindered by the 70 percent CO^2 content of the gas.

Esso Indonesia, the production-sharing contractor, in joint venture with Pertamina in this block, announced in early 1990 that it had found a viable solution for the disposal of the CO^2 and wished to proceed with the development of this project at an estimated $US12–15 billion.

Esso has evaluated the economics of various options for Natuna gas, including the construction of a grass roots LNG plant on Natuna Island and/or distribution of the gas via undersea pipeline to various markets including Batam Island, Singapore, the Duri Steam-flood Project in central Sumatra and the Arun LNG plant.

Esso is currently negotiating contract terms with Pertamina which would allow economic development of the project. The Pertamina Board of Commissioners, after hearing a preliminary review of the project in April 1991, authorised Pertamina to continue to negotiate with Esso.

Pipeline proposal

Executive Officer of the Philippines Office of Energy Affairs, Wenceslao T de la Paz, said the 10th ASEAN Economic Ministers Meeting on Energy Co-operation had considered at full length the proposed ASEAN pipeline grid. 'This is a good product. The Philippines is committed to participate in it', he said.

Construction of the ASEAN pipeline grid is not seen as any pipeline dream by the Australian industry. The development of the gas sector in the ASEAN countries calls for a 4,950 mile pipeline transportation network with a minimum capacity of 1.16 Bcfd, or 424 BCF per year. Most of the segments will provide for two-way flow.

The Trans-ASEAN pipeline, with headquarters probably in Singapore or Manila, would collect gas from production areas in the Gulf of Thailand, North Sumatra and Kalimantan, Sarawak, Sabah and Brunei. The gas would be moved to the main markets in Thailand, Singapore, Malacca, Sumatra, Java, Brunei and the Philippines, primarily Manila.

An Italo-French consortium, open to all EC and ASEAN companies, has been formed to conduct the feasibility study, the economical and technical aspects of the project.

Consortium members so far include Agip, Agip Petroli, Gaz de France, IMI, Snam, Total and Trans Energ. The ASEAN-EC Energy Management and Research Centre drew up the guidelines for these studies which were approved by senior officials on Energy Co-operation in June last year. The EC may help finance the project but most of the financing will come from the consortium.

The route

The planned ASEAN system will consist of 4,950 miles of pipeline, including 3,900 miles of main line. The offshore segments will total 680 miles. A total of 21 compressor stations will be built. Gas will move in both directions between the Kertch field in Malaysia and the Surabaya field in Java, as well as north-eastern Kalimantan. The seven major segments will include:

- Gulf of Thailand to Kerteh: 99 miles of offshore pipeline and 429 miles of onshore pipeline. Three compressor stations are planned.
- Kerteh to Malaysia: 193 miles of pipeline with a capacity of 424 Bcfy and one compressor station. Bi-directional flow.
- Malacca to Malaysia: 71 miles of offshore pipeline and 661 miles of onshore pipeline. Three compressor stations are planned. Bi-directional flow.
- Merak to Surabaya: 478 miles of pipeline and three compressor stations. Transport capacity will be 424 Bcfy. Bi-directional flow.
- Surabaya to Sepasu: 233 miles of

offshore pipeline and 428 miles of onshore pipeline and four compressor stations.

- Sepasu to Kadat: 571 miles of pipeline and three compressor stations. Bi-directional flow.
- Kudat to Manila: 276 miles of offshore pipeline and 472 miles of onshore pipeline and two compressor stations.

Existing features

Gas lines already planned or under construction in some of the countries to be served can be incorporated into the Trans-ASEAN project. Such lines would include Arco's planned 155 mile, 24 inch line to carry 300 mcfd of gas to shore from the Kangean field in the Java Sea and the planned trunkline to the Natuna Sea discoveries. In addition other pipeline projects in the planning stage could be incorporated in the venture.

In the Gulf of Thailand the $US 600 million development of the B-structure and related pipelines are going ahead. The Petroleum Authority of Thailand (PTT) has had second thoughts about the economic feasibility of additional pipeline capacity in the Gulf of Thailand and is expected to trim gas take from currently producing fields when the B-structure field reaches its peak production.

Malaysia has an estimated 1,500 Bcm of proven reserves to be exploited. Huge investments are planned for natural gas utilisation in Malaysia, including the $A3.7 billion Peninsular Gas Utilisation (PGU) Scheme.

Malaysian LNG (MLNG) is planning to expand the capacity of its Bintulu plant to 16 million tonnes/year, making it the largest LNG plant in the world, at a cost of $US2.5 billion.

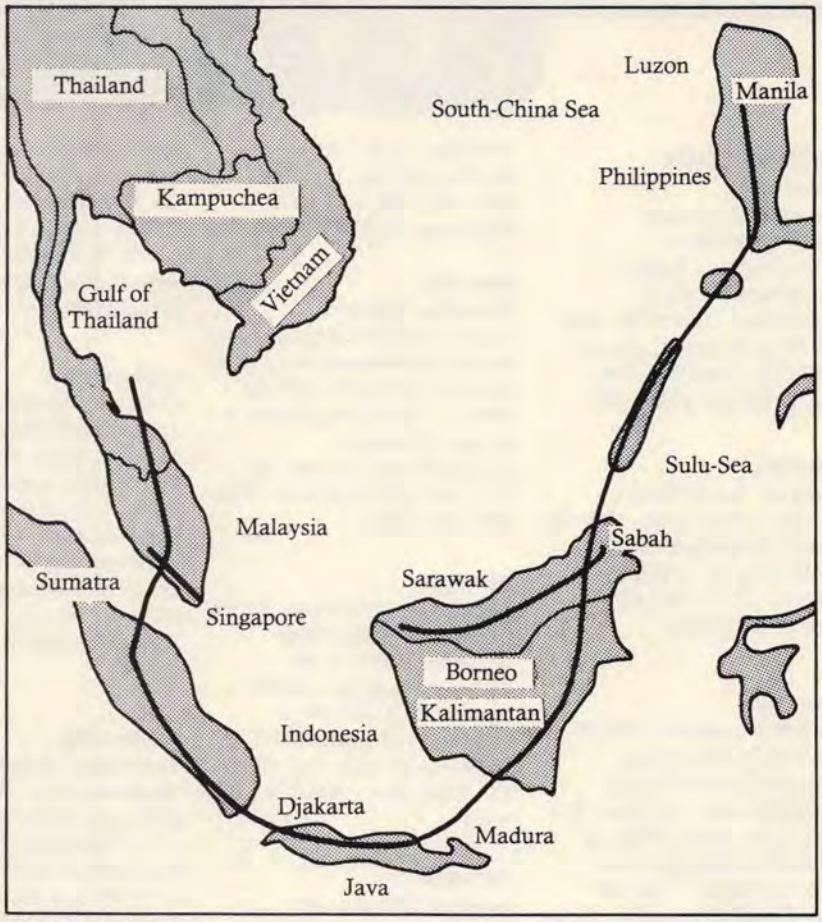
The four joint owners of the MLNG will double output capacity to 16 million tonnes by 1995. Partners are Mitsubishi, Shell, Petronas and the State of Sarawak. The four parties would split construction costs to build three more production trains in proportion to their equity holdings.

Indonesia is continuing its programme to maintain and strengthen its role as the world's number one LNG exporter. The state-owned Pertamina late last year signed a contract for an additional supply to Japan of two million tonnes a year of LNG which started this year. Deliveries are to Osaka Gas, Tokyo Gas and Toho Gas and will run for 20 years.

Malaysia's Peninsular Gas Utilisation Project Stage II (PGU II) which is now being implemented provides for the construction of a gas pipeline to link Kerih in Terengganu with Plentong in Johore. From Plentong one line will lead to the Pasir Gudang power station and another to Singapore's Senoko power station, which is situated near the causeway linking the island republic to Johore.

The pipeline linking Terengganu with Johore will be completed by the end of this year, while the line to Singapore is targeted for completion early in 1992. The cost of constructing the submarine pipeline across the Johore Straits will be shared equally between Singapore's Public Utilities Board (PUB) and Malaysia's national petroleum company, Petronas.

The 910 mm diameter × 455 miles pipeline is part of the PGU project which is designed to use the abundant material resources off the east coast of peninsular Malaysia.



ASEAN pipeline route

Singapore

Indonesian Minister for Mines and Energy, Ginandjar Kartasamita, announced that Pertamina and the PUB of Singapore were on the verge of concluding the terms for Indonesia's supply of natural gas to Singapore.

He made this announcement during the signing ceremony of the memorandum of understanding between the Sembawang Group and PT Bangun Cipto Indokarimun for the development of the Karimun Islands in Indonesia. 'Conoco's Matak field is closer to Singapore than Esso's Natuna field', said the minister. 'The Matak field will thus be supplying gas to Singapore first and the Natuna field later.'

Conoco has discovered oil in the Matak area and this may distract them from their original objective of supplying gas to Singapore, the minister said. 'I will have to remind them of their commitment to supply gas to Singapore,' he added. He envisaged that Singapore would be receiving Natuna gas by 1998 and Matak gas much earlier. The Matak field is about 600 km from Singapore and the Natuna field is about 1,000 km distant. ■

FORTHCOMING EVENTS

November

4th–7th
Teeside: Course on 'Managing Major Emergencies'. Details: Petroleum Training Federation, Room 326, 162–168 Regent Street, London W1R 5TB. Tel: (071) 439 2632. Fax: (071) 287 5483.

4th–7th
Geneva: 'World Clean Energy Conference'. Details: CMDC Zentralsekretariat, Kellerweg 38, CH-8055 Zurich. Tel: 411463 0206. Fax: 411463 0252.

4th–8th
Oxford: Course on 'Retail Marketing—Planning Economics and Future Developments'. Details: The Registrar, The College of Petroleum Studies, Sun Alliance House, New Inn Hall Street, Oxford OX1 2QD. Tel: (0865) 250521. Fax: (0865) 791474.

5th
London: Conference on 'Modern Technology in Pipelaying and its Associated Works'. Details: Executive Officer, Offshore Engineering Group. Institution of Mechanical Engineers, 1 Birdcage Walk, London SW1H 9JJ. Tel: (071) 222 7899. Fax: (071) 222 4557.

5th–7th
Chislehurst: Course on 'Safety of Electrical Equipment in Potentially Explosive Atmospheres'. Details: Sira Communications Ltd, South Hill, Chislehurst, Kent BR7 5EH. Tel: (081) 467 2636. Fax: (081) 467 7258.

5th–8th
Saigon, Vietnam: 'Saigon Oil and Gas Expo '91'. Details: Mrs C Wilden, Director, Enterprise Associates Ltd, 4th Floor, 43/44 Great Windmill Street, London W1V 7PA. Tel: (071) 439 4452. Fax: (071) 437 7233.

6th–7th
Brussels: 'Second International Conference on the Automotive Industry and the Environment'. Details: IIR Ltd, 11th Floor, Alembic House, 93 Albert Embankment, London SE1 7TY. Tel: (071) 412 0141. Fax: (071) 412 0145.

6th–8th
Singapore: 'Southeast Asian Energy/Petrochemical Seminar'. Details: Mr Stephen Rothman, Chem Systems Inc, 303 South Broadway, Tarrytown NY 10591–5487, USA. Tel: (914) 631 2828. Fax: (914) 631 8851.

7th–8th
London: Seminar on 'Electrostatic Hazards in Industry'. Details: Amanda Wright, IBC Technical Services Ltd, Gilmoora House, 57–61 Mortimer Street, London W1N 7TD. Tel: (071) 637 4383. Fax: (071) 631 3214.

7th–8th
London: Conference on 'Total Quality Management for the Offshore Industry'. Details: Nadia Ellis, IBC Technical Services Ltd, Gilmoora House, 57–61 Mortimer Street, London W1N 7TD. Tel: (071) 637 4383. Fax: (071) 631 3214.

11th
London: Seminar on 'Safer Handling, Storage and Transport of Hazardous Chemicals'. Details: Profex, Buckingham House, The Broadway, Stanmore, Middlesex, HA7 4DP. Tel: (081) 954 9546. Fax: (081) 954 5772. Also in Coventry on 26th November.

11th
London: Conference on 'Joint Operating Agreements'. Details: European Study Conferences Ltd, Douglas House, Queen's Square, Corby, Northants NN17 1PL. Tel: (0536) 204224. Fax: (0536) 204218.

11th–12th
Cobham: Course on 'An appreciation of aviation fuel quality control in the distribution system—refinery to aircraft'. Details: Dr E Goodger, RouteSouth-West Ltd, East Anglian Office, 28E Jessopp Road, Norwich, Norfolk NR2 3QB. Tel: (0603) 51842. Fax: (0603) 259950.

11th–14th
The Hague, Netherlands: Conference on 'Health, safety and environment in oil and gas exploration and production'. Details: Society of Petroleum Engineers Europe Ltd, 4 Mandeville Place, London W1M 5LA. Tel: (071) 487 4250. Fax: (071) 487 4229.

12th
London: Conference on 'Challenges in Energy Statistics'. Details: Judith Higgins, The Institute of Energy, 18 Devonshire Street, London W1N 2AU. Tel: (071) 580 0008. Fax: (071) 580 4420.

12th–13th
Aberdeen: Conference on 'Minimum Facilities for Offshore Oil and Gas Production'. Details: Nadia Ellis, IBC Technical Services Ltd, Gilmoora House, 57–61 Mortimer Street, London W1N 7TD. Tel: (071) 637 4383. Fax: (071) 631 3214.

12th–14th
Aberdeen: 'Subtech 91'. Details: Judith Patten Public Relations, Neville House, 55 Eden Street, Kingston upon Thames, Surrey KT1 1BW. Tel: (081) 547 1566. Fax: (081) 547 1143.

12th–15th
Birmingham: Exhibition and congress 'Auto Tech 1991'. Details: Automobile Division, Institution of Mechanical Engineers and Centre Exhibitions, The National Exhibition Centre Ltd, Birmingam B40 1NT. Tel: (021) 780 4141. Fax: (021) 780 2518.

14th
London: Conference on 'New Developments in Information Technology for the Energy Industries'. Details: Caroline Little, The Institute of Petroleum, 61 New Cavendish Street, London W1M 8AR. Tel: (071) 636 1004. Fax: (071) 255 1472.

14th
London: Evening lecture on 'Power Generation in the Future: The Swedish Case'. Details: The Royal Society, 6 Carlton House Terrace, London SW1Y 5AG. Tel: (071) 839 5561.

14th–15th
Amsterdam, Netherlands: Conference on 'New Developments in the International Energy Marketplace—meeting the challenges of the 21st century'. Details: IIR Limited, 28th Floor, Centre Point, 103 New Oxford Street, London WC1A 1DD. Tel: (071) 379 8040. Fax: (071) 412 0143.

14th–15th
London: Conference on 'Electrostatic Hazards in Industry'. Details: Amanda Wright, IBC Technical Services Ltd, Gilmoora House, 57–61 Mortimer Street, London W1N 7TD. Tel: (071) 637 4383. Fax: (071) 631 3214.

16th–19th
Bahrain: '7th SPE Middle East Oil Show and Conference'. Details:

FORTHCOMING EVENTS

Overseas Exhibition Services Ltd, 11 Manchester Square, London W1M 5AB. Tel: (071) 486 1951. Fax: (071) 486 8773.

18th–19th
London: Conference on 'Offshore Safety Cases—Preparation and Implementation'. Details: Natalie Cox, IBC Technical Services Ltd, Gilmoora House, 57–61 Mortimer Street, London W1N 7TD. Tel: (071) 637 4383. Fax: (071) 631 3214.

18th–21st
Cranfield: Course on 'Instrumentation and Systems for Research and Development'. Details: The Short Course Adminstrator, Department of Fluid Engineering and Instrumentation, School of Mechanical Engineering, Cranfield Institute of Technology, Bedford MK43 0AL. Tel: (0234) 752766. Fax: (0234) 750728.

18th–22nd
London: Course on 'Ship Management and Operations'. Details: Merchant Prospect Limited, 20 Victory Road, West Mersea, Colchester, Essex CO5 8LX. Tel: 0206 383593. Fax: 0206 383839.

19th–20th
Stavanger, Norway: 'Offshore Northern Seas 1991'. Details: ONS Advanced Petroleum Conference, PO Box 175, N-4001 Stavanger, Norway. Tel: (47) 55 81 00. Fax: (47) 4 55 22 70.

19th–21st
Prague, Czechoslovakia: Conference on 'Business and Investment Opportunities in Eastern Europe: Regional and Industry Perspective'. Details: DRI Europe, Wimbledon Bridge House, 1 Hartfield Road, Wimbledon, London SW19 3RU. Tel: (081) 543 1234. Fax: (081) 545 6248.

19th–22nd
Malta: 'Clean Seas 91'. Details: Lesley Ann Sandbach, Spearhead Exhibitions Ltd, Rowe House, 55–59 Fife Road, Kingston upon Thames, Surrey KT1A 1TA. Tel: (081) 549 5831. Fax: (081) 541 5657.

20th
Sheffield: Course on 'Treatment and Disposal of Chemical Waste'. Details: Mrs K Wainwright, CCVE, The University of Sheffield, 65 Wilkinson Street, Sheffield S10 2GJ. Tel: (0742) 768653.

20th–21st
London: Conference on 'The Realities of Integrated Pollution Control Regulations'. Details: Customer Services, IIR, 11th Floor, Alembic House, 93 Albert Embankment, London SE1 7TY. Tel: (071) 587 1117. Fax: (071) 587 3703.

20th–22nd
Birmingham: 'Third National Conference—Association for Geographic Information'. Details: AGI 91 Conference, Westrade Fairs Ltd, 28 Church Street, Rickmansworth, Herts WD3 1DD. Tel: (0923) 778311. Fax: (0923) 776820.

21st
London: Conference on 'Is There a Future for Independents in the UK North Sea'. Details: Caroline Little, The Institute of Petroleum.

21st–22nd
London: Conference on 'Making Energy from Waste Profitable'. Details: IIR Ltd, 28th Floor, Centre Point, 103 New Oxford Street, London WC1A 1DD. Tel: (071) 412 0141. Fax: (071) 412 0145.

24th–27th
Melbourne, Australia: Exhibition and Conference on 'Offshore Australia'. Details: Mr Bill Hare, Australian Exhibition Services Pty Ltd, Illoura Plaza, 424 St Kilda Road, Melbourne 3004, Victoria, Australia. Tel: (03) 867 4500. Fax: (03) 867 7981. Telex: 39329.

26th
London: Conference on 'Safety/Standby Vessels—The New Requirements'. Details: Miss Caroline Little, The Institute of Petroleum.

26th
Coventry: Seminar on 'Safer Handling, Storage and Transport of Hazardous Chemicals'. Details: Profex, Buckingham House, The Broadway, Stanmore, Middlesex, HA7 4DP. Tel: (081) 954 9546. Fax: (081) 954 5772.

28th–29th
Dresden, Germany: Conference on 'Energy Technologies Investments in Today's Europe—Markets, Projects, Finance'. Details: VDI-Gesellschaft Energietechnik, PO Box 10 11 39, W-4000 Dusseldorf 1, Germany. Tel: 49 211 6214–414.

29th
London: Seminar on 'Indonesia Energy—Prospects for British Contractors and Suppliers'. Details: Lisa Sturge, Business Briefings Ltd, 565 Fulham Road, London SW6 1ES. Tel: (071) 381 1284. Fax: (071) 385 0974.

December

2nd–3rd
London: Sixth Annual Energy Conference 'Energy Policy: Market-Led or Government Driven?' Details: The Conference Unit, Royal Institute of International Affairs, Chatham House, 10 St James's Square, London SW1Y 4LE. Tel: (071) 930 2233.

3rd–4th
Harrogate: Gas '91 exhibition and conference on 'The State of the Art and the Way Ahead'. Details: Mr Rex Cooke, The Institution of Gas Engineers, 17 Grosvenor Crescent, London SW1X 7ES. Tel: (071) 245 9811.

3rd–4th
London: Conference on 'UK and European Gas Price, Supply and Demand'. Details: Maura Fay, IBC Financial Focus Ltd, 57/61 Mortimer Street, London W1N 7TD. Tel: (071) 637 4383. Fax: (071) 323 4298.

4th–5th
London: 'Subsea 91—International Conference'. Details: Subsea 91 International Conference, Themedia Ltd, PO Box 2, Chipping Norton, Oxon OX7 5QX. Tel: (060884) 700/888. Fax: (060884) 796.

9th
London: Seminar on 'Use of Polymers in Drilling and Oilfield Fluids'. Details: Cathryn Evans, PRI, 11 Hobart Place, London SW1W 0HL. Tel: (071) 245 9555. Fax: (071) 823 1379.

11th
Chislehurst: Course on 'Flammable and Toxic Gas Detection'. Details: Sira Communications Ltd, South Hill, Chislehurst, Kent BR7 5EH. Tel: (081) 467 2636. Fax: (081) 467 7258.

11th–12th
London: Conference on 'Multiphase Operations'. Details: IBC Technical Services Ltd, Gilmoora House, 57–61 Mortimer Street, London W1N 7TD. Tel: (071) 637 4383. Fax: (071) 631 3214.

'New OPEC agreement means that market demand will be met'

By Dr Joseph Stanislaw, Cambridge Energy Research Associates

The meeting of the Organisation of Petroleum Exporting countries in Geneva in September ended after one and a half days with two key decisions. Firstly, it reaffirmed the $21 price objective and secondly, it fixed a quota of 23.65 million barrels per day (mbd) that included Kuwait and Iraq but did not allocate specific quotas for any country.

The reality is clear. OPEC, led by Saudi Arabia, will continue to produce at the high levels of production seen in the third quarter and all countries will be more or less at capacity. Also, it is clear that OPEC is prepared, at least conceptually, to accommodate the re-entry of Iraqi and Kuwaiti exports.

The outcome of the meeting is a 'bending' to the Saudi view that volume reality — production capacity — matters. But, by not officially allocating individual quotas, OPEC did not formally endorse this view. It is a view that is not written or stated officially but, in effect, says that when OPEC needs to consider possible production cutbacks to accommodate higher levels of Iraqi and Kuwaiti production, the Saudis want the starting-point to be full capacity numbers, not the pre-Gulf war quotas. However, given the current state of tension between Iraq and the countries participating in the UN inspection teams operating in Iraq, the timing of the arrival of those exports to the market is becoming increasingly uncertain. When that time does come, there will be bitter discussion within OPEC. Saudi Arabia, at least for now however, intends to maintain its 'take-it-or-leave-it' negotiating stance.

However, for the market what matters is not OPEC but rather the physical fundamentals and the current view that, given the state of uncertainty concerning the Soviet Union, winter weather and Iraqi exports, high levels of production are needed. The new OPEC agreement means that market demand will be met and, barring an unforeseen catastrophe somewhere in the world, OPEC production, and if necessary Saudi inventories will keep prices from spiking. For the fourth quarter Cambridge Energy Research Associates (CERA) estimates that the OPEC basket price will remain in a range of $19–$22. This is equivalent to $20–$23 for Brent and $21–$24 for WTI.

US product markets

The seemingly chronic problem of very low residual fuel oil prices will most likely continue in the fourth quarter but with some improvement this winter in the lower sulphur market. As a result, sophisticated high conversion refineries that can convert high sulphur resid to light products will be at an advantage. Less complex refineries that produce large amounts of resid will have a difficult time making up their losses from resid in the light products market. As a result, these refiners will be faced with two options:

- To run crudes that are low in resid content or yield a low sulphur resid, such as WTI. Both of these factors will serve to keep the prices of WTI and similar crudes relatively high compared to poorer quality oils.
- To reduce crude runs.

Given the current high levels of product inventory, the latter option will likely be the preferred choice.

US primary distillate stocks continue to rise and currently stand at the highest autumn level in several years. The mid-continent has been 'drowning' in middle distillate stocks. However, demand should begin to draw these stocks down. Demand is at last beginning its seasonal rise. Primary distillate stocks have historically levelled off by late September early October and either held steady or declined from then through the winter season.

Distillate demand could increase by about 0.2mbd from current levels by mid-October, primarily due to agricultural activity and early secondary and tertiary inventory restocking. Demand then typically levels off until the winter season sets in and then rises depending on the weather.

Secondary distillate stocks have been close to typical seasonal levels. Thus, a sudden change in market psychology prices may lead to an increase in demand from jobbers and wholesalers and support for distillate prices.

A key factor for the market will be if primary distillate stock levels stabilise during October. Once the harvest season is under full steam, there is very little demand until the cold weather sets in to take off inventories. It should be noted that a period of severely cold weather early in the season in the northeastern United States could reduce distillate stocks and shift the current perception of well supplied to supply uncertainty for much of the duration of the winter.

Far East product markets

Oil demand in the Far East is showing signs of lower growth, although much of this apparent slowing is due to circumstances, not a change in market fundamentals. In Japan, demand has slowed since the second quarter for four main reasons:

- A slowdown in the economy;
- Stockpiling early in the Gulf War;
- A cooler summer than 1990;
- Restart of nuclear power facilities out for maintenance.

For the fourth quarter and 1992, we expect a resumption of more normal growth and a 1991 average of 1.6–2 percent.

With winter approaching, kerosene is the focal point of the market in the region, and there are indications that fourth quarter demand could be strong. Japanese and Korean stocks are considerably below 1990 levels but concerted stock building is still not evident. Both Japanese and Korean refiners appear to be counting on increased domestic supplies from higher runs to meet demands. With some additional refining capacity available in the fourth quarter, supplies should be adequate but an early cold snap could lead to a scramble for supplies.

The end of hot weather has brought the end of the mini-boom in residual fuel demands that was evident over the summer and sagging prices for low sulphur residual fuel in the region are expected to continue through the winter.

The South Korean government has announced that it will sell 10 million barrels of oil from strategic stockpiles during the fourth quarter in an effort to reduce the 1991 balance of payments deficit. This will effectively reduce crude imports in that country by 0.11mbd during the quarter.

OECD Europe product markets

CERA expects fourth quarter demand in OECD Europe to grow by 4.7 percent from a year earlier — a volume growth of 0.5–0.7mbd. Pent up demand for heating oil in Germany will need to be satisfied once Rhine river levels rise. During the third quarter low Rhine levels reduced barge traffic from Rotterdam to the bare minimum. As many German consumers stocked up in the second quarter, however, the strength of fourth quarter demand will be heavily influenced by the weather. Mild weather would mean that only those consumers who did not buy stocks before 1 July would need to build stocks in the fourth quarter. Colder weather could bring all consumers onto the market.

Dr Joseph Stanislaw

Residual fuel markets will also get a boost from stronger than expected demand from Italian utility ENEL and continued support from the much smaller French market. ENEL has returned to the resid market in a big way in the fourth quarter after running down stocks in the third. To complicate matters, ENEL is insisting that suppliers meet tough new nickel limitations set by the Italian government. This has set traders scrambling for supplies as many European refiners, particularly the Italians, are not equipped to provide the low sulphur, low nickel content residual fuel oil that ENEL will require as of 31 October. The result of ENEL's announcement was a widening of the differential between high and low sulphur resid from $10 in August to almost $30 by mid-September.

Although France is not a big residual fuel consumer, mediocre hydropower availability, extended nuclear maintenance and a saturated coal delivery system have put state utility Electricité de France (EdF) on the market for about 40 to 60thbd of low and very low sulphur residual fuel oil since January. We expect that EdF will continue to purchase at this level at least through the first quarter of 1992.

EC energy tax proposal

A storm in a teacup was created by the timing (or mis-timing) of the announcement by the European Commission that it would recommend to the EC Council of Ministers a 'strategy' for energy and the environment that included the long-discussed proposal for a $10/barrel 'energy and carbon tax'. The idea proposed is that national governments of the Community should look favourably on the idea of reducing direct and other indirect taxes and making up the difference with a tax on energy that would promote energy saving and might yield environmental benefits.

The European Commission does not have tax-raising powers. Neither does the Council of Ministers as such. But the Council, if it were to respond positively to the Commission's suggestion, could influence real decisions by national governments of the Community on taxation policy. However, CERA's clear understanding of the balance of political forces at national and Community level is that there is little likelihood that Finance Ministries will, at this time, adopt or implement the suggestion. National taxation policies in European countries are influenced by a host of factors — and the Commission's proposal, while now on the agenda for civil service discussions in the preparation of national budgets over the next few years, will almost certainly figure a long way down the list.

The timing of the announcement that a communication would be sent to the Council on the subject was curious — and from the Community's point of view unfortunate. OPEC ministers were in session discussing oil prices and production. The world's press and wire services were quick to pick up the 'headline-catching' $10/barrel energy tax aspect of the Commission's announcement. Naturally this provoked an immediate outburst of resentment among producer countries, who could legitimately interpret a $10/barrel tax as a way for consuming countries to seize the economic rent out of oil production.

But the timing was due to quirks of the bureaucratic process of the European Commission. The proposal has, over the past several months, faced stiff opposition from within the Commission itself. The proposal had failed to be adopted by the Commission several times in the past because of this opposition. Finally, only after certain compromises had been struck, did the Commission as a whole accept the proposition that a communication of a proposal to the Council should be adopted. The proposal will be controversial in the Council, strongly opposed and will most likely be rejected in its current form and quietly dropped. However, while the issue remains wounded, it is not dead yet.■

Flowmeters — their role in loss reduction in refining

By Dr R A Furness, ABB Kent Taylor Ltd, and P A M Jelffs, Consultant

This paper looks at the use of metering systems for measuring quantities into and out of the refinery such as pipeline, ship, road and rail loading systems.

One major advantage of measuring oil by meter is that the accuracy of the quantity delivered is not dependent on the parcel size, whereas the accuracy of quantities based on tank transfer measurement can vary according to the depth of liquid drawn from the tank. This aspect has become important as most deliveries, irrespective of parcel size, are now being made on the basis of spot measurement and have to be within ± 0.2 percent (standard volume) in order to satisfy custody transfer, fiscal, or duty requirements.

Another advantage of measuring by meter is that the assembly can be located at the end of a long pipeline on a jetty for ship loading purposes. This also overcomes the problem of measuring several parcels from the same shore tank into several ships.

The considerable cost of installing a metering system is usually difficult to justify strictly in terms of loss savings. One way of looking at this problem is to recognise that measurements based on shore tank transfers can vary according to the difference between the initial and final liquid level, Δh.

For example a Δh larger than 7 metres gives an uncertainty in the delivered quantity of the order of $\pm$ 0.2 percent, whereas for a Δh of less than 1 metre the uncertainty is about $\pm$ 1.0 percent. However, the metering system should achieve better than $\pm$ 0.2 percent irrespective of the size of throughput.

Therefore there will be a number of occasions when losses in excess of 0.5 percent will occur when using shore tank measurements. These represent potential claims for under-deliveries and can be quantified in terms of savings over a number of ship loadings and offset against the cost of installing meters (see **Figure 1**). Although in theory these variations should cancel out over a period of time, the over-deliveries are not normally recoverable.

Types of flowmeter

There are more than 100 different designs of flowmeter that are currently commercially available. Each has strengths and weaknesses and its 'niche' applications, but very few can be used for loss control because of basic performance limitations. The operating principle forms a convenient basis for classifying flowmeters; **Table 1** from BS 7405 shows the newly accepted groupings.

An analysis of published performance figures of these various groups produces an interesting picture, as detailed in **Figure 2.** For leakage control, high inherent performance is required; published data show Groups 3 (positive displacement) and 4 (turbine types) offer the lowest level of measurement uncertainty. These types of meter have traditionally been applied to loss control but there are indications that the Coriolis types (direct mass flow meters, Group 8) may have sufficient repeatability for future consideration. Tests are currently in progress to evaluate the performance under fiscal conditions but it is too soon to draw firm conclusions. Present indications are generally favourable but field calibration is proving to be a problem, as discussed later.

Group Number	Description
1	Conventional DP Types
2	Other DP types
3	Positive displacement types
4	Rotary inferential types
5	Fluid oscillatory types
6	Electromagnetic types
7	Ultrasonic types
8	Direct mass types
9	Thermal types
10	Miscellaneous types
11	Solids meter types
12	Open-channel types

Table 1: Basic flowmeter classification

It should be noted that the data given in **Figure 2** are those which are normally achieved in straight pipes with pulsation-free, fully-developed flow. In practical installations these conditions rarely occur and, unless the meters are calibrated *in situ*, such low overall uncertainty figures should not be expected. Fortunately, in loss analysis and control applications the meters performing the measurement are regularly calibrated, frequently *in situ*, and properly maintained.

Crude oil imports

Crude oil imports by vessel are seldom metered as it is almost impossible to eliminate entrained air due to the stripping of ship's tanks. Experience has shown that air entrained in crude oil with viscosities in excess of 10 centistokes can result in over estimating the delivered quantity by up to 0.2 percent. Although in theory it should

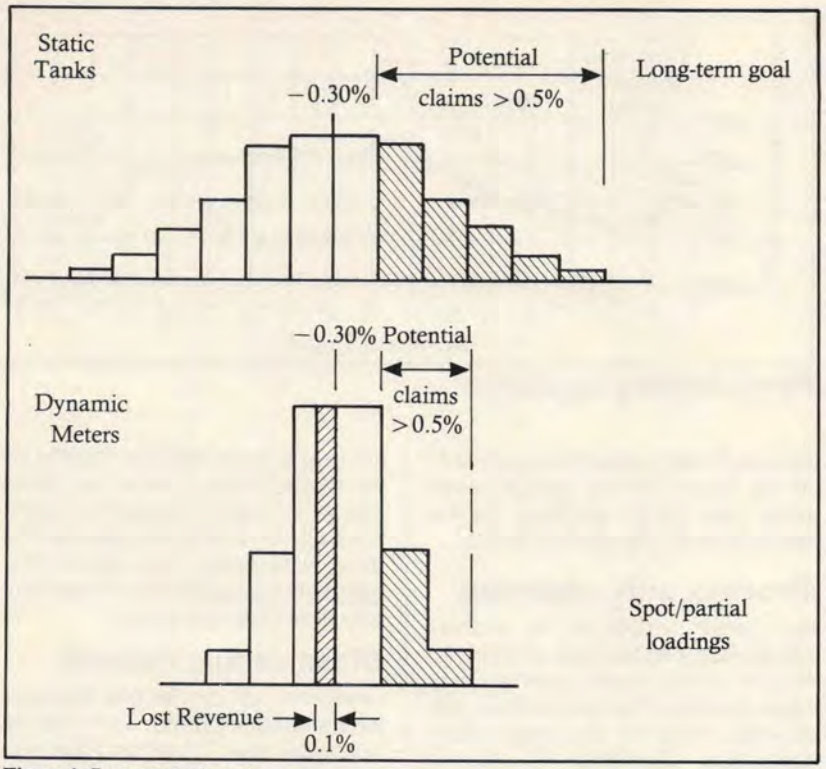


Figure 1: Loss control goals.

be possible to pump out a tanker without sucking in air, the time required would be prohibitive in terms of demurrage. A residence time of over 12 hours is normally required in order to remove entrained air. For this reason crude oil should be pumped into shore tanks before measurement.

Crude oil in pipelines is normally measured by several turbine meters in parallel; this ensures that the meters are always operating in that part of the flow range (20–100 percent of maximum flow) where the readings are most accurate. Also there is provision for an additional spare meter in the event of mechanical failure. Where the crude oil has a viscosity in excess of 20 centistokes, it may be necessary to employ positive displacement meters, although their cost can be as much as four times that of a turbine meter. The performance of the various types of meter and pipe provers is discussed in detail later. A dedicated pipe prover is normally required so that individual meters can be proved during each ship loading operation.

Ship loading systems

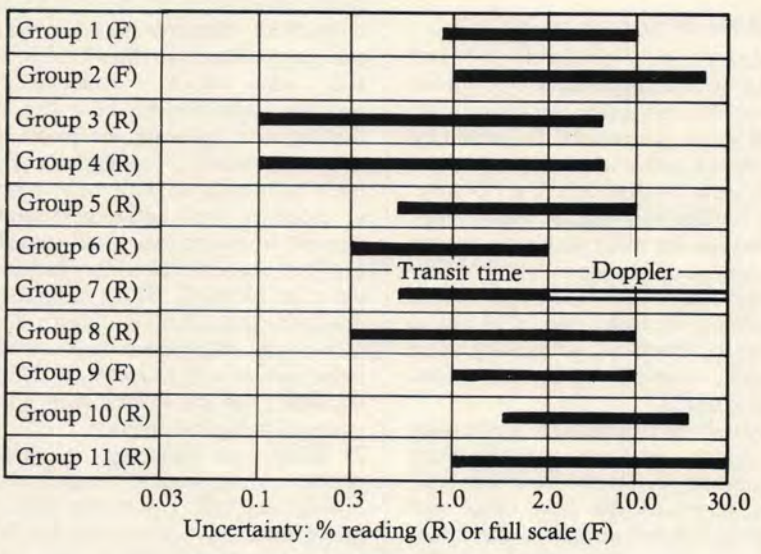
There are a number of considerations which must be taken into account when designing an export metering system. These are often looked on as commercial penalties incurred in installing metering systems for measuring refined products.

1) Increased pressure drop. In order to prevent cavitation across a meter, a pressure drop of 0.5 to 1.0 bar is required in addition to that created by pipe friction. This may require larger pumps in order to maintain the same flow rate experienced when loading by tank measurement.

2) Pipeline quantity uncertainty. As described above, the metering skid should be located at the jetty. However, if the jetties were not originally designed to accommodate the metering system, this may result in considerable extra cost in terms of the additional space and weight required.

3) Meters sensitive to flowrate. As turbine and PD meters are sensitive to flowrate, it is sometimes necessary to install several meters in parallel so as to ensure that, if the flowrate during loading is varied, the individual meters are always operating in their linear flow range.

4) Proving Requirements. Most custody transfer agreements stipulate that the meters shall be proved at least once at the average flowrate during the loading. This means that facilities for proving the individual meters must be laid on. A recent innovative solution was to employ small-volume pipe provers for regular proving at three monthly intervals and to use a computer monitoring technique based on the 'Universal Vessel Experience Factor' for detecting any significant variation in the individual meter factors. (This method compares the metered quantity with the ship's quantity on a moving-average basis. Although ship's figures can vary from ±1 percent of the true figure, the long-term mean of the ship's figures divided by the meter figure is 1.0020 see



Group	Description		
1	Conventional DP meters	6	Electromagnetic meters
2	Other DP type meters	7	Ultrasonic meters
3	Positive displacement meters	8	Mass meters
4	Inferential meters	9	Thermal meters
5	Fluid oscillatory meters	10	Miscellaneous meters
		11	Solids meters

Figure 2: Published performance distribution of Flowmeters.

Figure 3).

5) Minimum Accuracy Requirements. One major oil company has stipulated that the export product metering systems shall be designed to achieve an uncertainty of ±0.20 percent. Experience has shown that this figure can be achieved in practice provided the metering system is carefully designed by selecting meters and provers which have the required performance on the product being measured (see Meter Performance and Selection).

Pipeline metering

Both crude imports and refined product exports can be delivered to and from the refinery by pipeline systems. Most pipeline measurement is by meters located at both ends of the line. The major problem is achieving acceptable reconciliation between meters separated by a large quantity of oil at varying temperature, pressure and density over a short period of time. Short-term reconciliation can give variations between the meters of up to 1 percent. However, as the accounting period lengthens so the reconciliation improves, ie over a year most systems can achieve agreement of better than 0.2 percent.

In order to eliminate any long term systematic error it is important to ensure that all the provers are calibrated by the same equipment traceable to national standards.

Road and rail loading

Refinery export of products by road and rail is measured by either PD or turbine meter. As most gantry loading involves relatively small parcels, it is important to select a meter which exhibits a low slip rate at low flowrates. The PD meter has fulfilled this role for many years. However, the main problem has been its poor performance in terms of flow range; this is due to the high torque applied to the meter rotor in having to drive the 'stack-up', comprising ticket printer, shut-off valve and preset mechanism.

Recent developments in fitting pulse generators and powering the ancillary equipment separately have dramatically improved the flow range and accuracy of the meter. Turbine meters are now being considered for this service and, provided facilities are available for rapid 'start and stop', the influence of the high slip factor should be reduced. The advantage of pulse generation is that it eliminates the need for physical adjustment of the meter factor.

Several new innovative proving devices are now being considered, such as the small volume prover/master meter and vortex shedding master meter (with turbine meter in series).

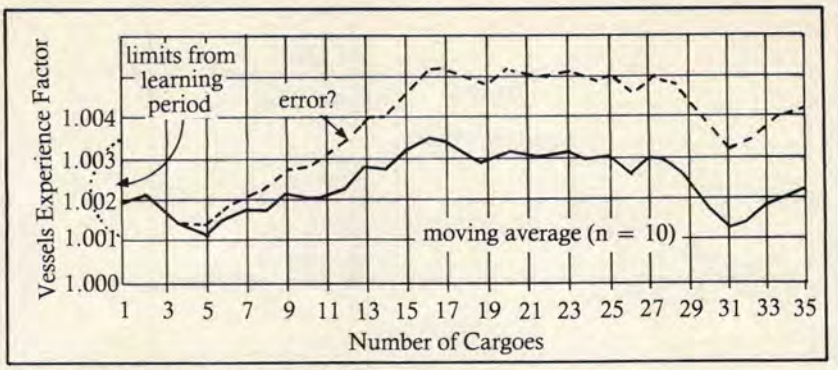


Figure 3: Monitoring loading by VEF.

Process unit metering

As meters employed in process measurement seldom have to meet the level of custody transfer accuracy, it is often possible to do away with on-line proving which can be commercially prohibitive. Therefore, the use of meters which have no moving parts can be advantageous in that they are unlikely to drift or change their accuracy with time.

Although it is not possible to review process metering in any depth in this paper, a number of general problems are discussed below:—

1) Gas metering. The major problem in measuring process gas is that the fluid is often 'wet'. Provided there are no particles of water or gas liquid in the gas stream, the plate should retain its sharp edge which is essential for accurate measurement. (The cost of facilities for removing the plate on-stream is usually prohibitive.) The main problem is locating these meters in pipelines with sufficient straight sections to ensure that a full velocity profile can be achieved and so eliminate the effect of 'swirl'. These meters seldom achieve an accuracy of better than 4 percent. Alternative non-conventional meters such as vortex shedding, ultrasonic and gas turbine meters are currently being investigated.

2) Flare gas metering. A major problem is the accurate measurement of flare gas. Many different types of meter have been employed for this service but few are able to cope with the large flow range experienced in operation. The main problem is in assessing the accuracy of these meters on site. There is a need for an on-site calibration service employing radioactive tracer techniques.

3) Difficult liquids. Meters with rotors and bearings, such as turbine meters, are usually unsuitable for naphtha as the bearings tend to wear and some form of lubrication is required. Heavy black oils have to be measured by PD meter with heavy duty rotors (gear type) with large clearances. The meters may have to be heat traced.

Mass versus volume

In order to achieve the best reconciliation across the refinery, it is necessary to employ mass balancing. However, the performance of direct mass meters is still being investigated.

As most meters are basically volume measuring devices, density has to be determined on site on the product being measured. Although density can be measured accurately in the laboratory, it is still a major problem in the field. On-line density meters are not yet capable of achieving better than ± 0.3–0.5 percent accuracy. This is mainly a problem of calibration rather than repeatability. However, there will probably come a time when there will be sufficient number of shore tanks with direct mass systems (hydrostatic tank gauging) to enable a comparison to be made with direct mass meters.

Turbine versus PD

Any comparison of the performance of different types of meter must take into account the cost, short and long term accuracy, reliability and suitability for various products (see **Figure 4**).

Both turbine and positive displacement meters employ rotors which are subject to blade damage and bearing wear. This means that the accuracy of the readout will tend to deteriorate with time so that the throughput quantity will be under estimated, resulting in the give-away of product to the receiver.

Although these conventional meters have the best overall performance they need to be proved on a regular basis and this is a major commercial disadvantage when compared with non-conventional meters which have no

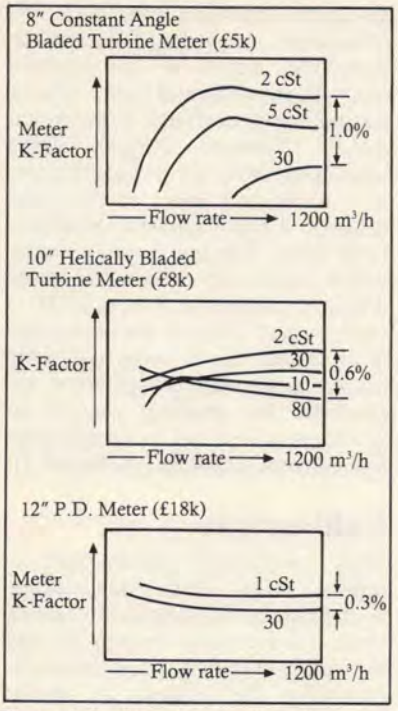


Figure 4: Performance versus cost of meters.

moving parts ie vortex shedding, ultrasonic and Coriolis meters.

Turbine meters

There are two main types of turbine meter on the market — the constant angle, or straight-bladed, meter and the helically-bladed meter.

The main advantage of the helically-bladed meter is that its performance is less affected by the influence of viscosity than the straight-bladed meter. The manufacturers ensure that the performance of each individual meter has been verified in a laboratory by proving on a number of oils of different viscosities. Each meter is guaranteed to meet certain overall performance criteria, for instance a maximum change in K-factor of $\pm$ 0.3 percent over 10 to 100 percent flow range with a variation in viscosity of 2 to 50 centistokes.

The K-factor can also be predicted from a polynomial based on flowrate and viscosity. This only applies to meters larger than 4 inches. However, the helically-bladed meter generates about one tenth of the pulses per revolution produced by the constant angle meter. This means that pulse interpolation is required when proving with conventional provers and there may be a problem in using a small volume prover.

The helically-bladed meter, although more expensive than the constant angle meter, is now being employed on the North Sea for production and allocation metering purposes.

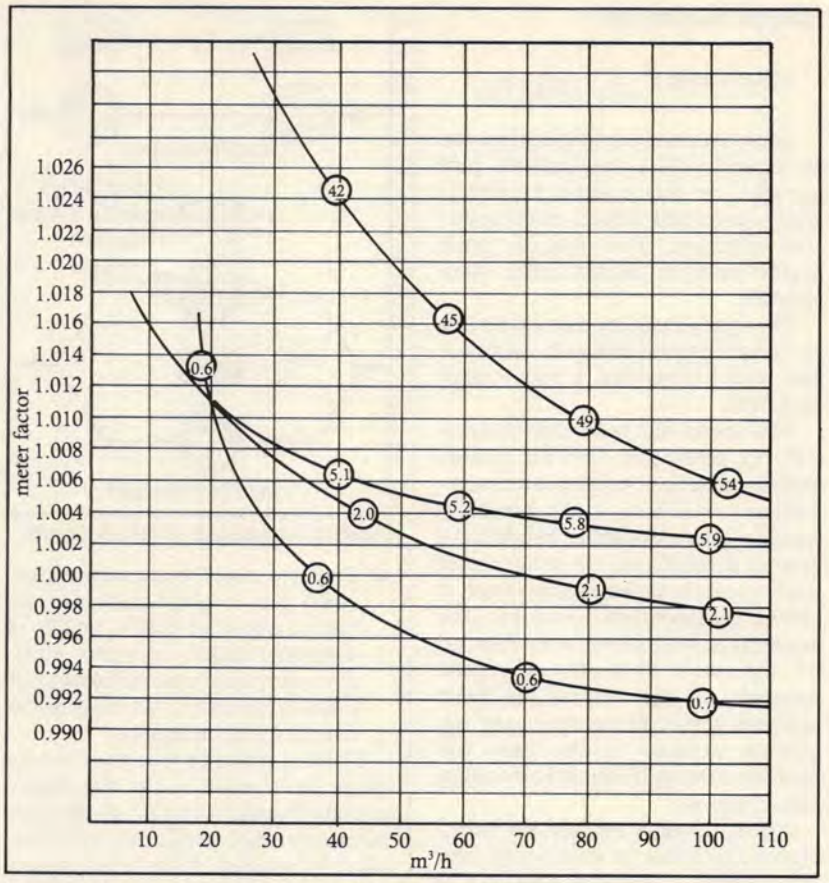


Figure 5: Performance of 4" Turbine Meter viscosity (49) cSt.

The main disadvantage of both types of turbine meter is that they have a very significant 'slip factor'. This tends to limit the use of these meters to ship loading where the parcel size is relatively large. However, turbine meters are increasingly being used for dispensing products in gantry road/rail loading facilities where provision is made for an instant start and stop procedure.

The influence of swirl on the meter performance is significant and it is important to ensure there is adequate flow conditioning up-stream of the meter.

Contrary to common belief, turbine meter K-factors change significantly when measuring oil with viscosity less than 1 centistoke (see **Figure 5**); this results in a reduced 'turndown ratio'. For this reason turbine meters smaller than 2 inches should not be employed for measuring LPG.

Positive displacement

The Positive Displacement, or PD, meter has negligible slippage at low flow rates and therefore is normally preferred to the turbine for dispensing products. There are basically two types the 'high pressure drop' and the 'low pressure drop' type. The former has very close fitting rotor vanes with small clearances so that the slippage is not significant at low flowrates. This feature gives an excellent flow range but the meter is subject to damage when measuring motor spirit containing particles or measuring high viscosity oils. The 'low pressure drop' meter has larger vane clearances and therefore is more sensitive to viscosity changes but less prone to blade damage.

The PD meter has an excellent performance over a wide flow and viscosity range (2 to more than 100 centistokes). These meters exhibit a significant change in meter factor when measuring liquids with viscosities less than 1 centistoke, ie motor spirit and LPG.

One important advantage of the PD meter is that no up-stream flow conditioning is required; however the cost is about four times that of the turbine meter covering the same flow range.

Vortex shedding

The vortex shedding meter, although sensitive to viscosity, has no moving parts and therefore does not need frequent proving. Experiments have shown that the meter factor is basically a function of Reynold's Number. It is possible to prove this meter on water in a laboratory and to predict the meter factor at other flowrates and viscosities,

using the relationship:—

$$\text{Meter factor} \propto \frac{1}{\sqrt{\text{Reynold's No.}}}$$

The maximum size of meter that can be proved with a conventional pipe prover is the 3 inch as the number of pulses generated reduces as the meter size increases. The irregular pulse width tends to restrict pulse interpolation.

The vortex shedding meter is limited to measuring products with viscosities less than 1 centistoke, ie motor spirit and LPG.

This meter has been used successfully for measuring LPG for custody transfer purposes. A portable unit comprising two 2 inch vortex meters in series, with a mesh screen between the meters to eliminate the influence of vortices on the down stream meter, is proved in a laboratory once a year. The readouts of both meters are compared at the same flowrate at regular intervals. As the ratio of the meter readouts should be constant, any significant variation in this ratio will indicate damage to one or both meters (see **Figure 6**).

Again, contrary to common belief, this meter is not as sensitive to flow conditioning as the turbine meter. The only special requirement is that the meter is accurately aligned with the pipework so that there are no shoulders which may produce spurious vortices.

Coriolis effect mass

The Institute of Petroleum is about to publish a 'state of the art' technical paper on this type of direct mass meter. Some of the problems with this meter are reviewed below:

1) Most Coriolis meters are influenced by density. Although this is a secondary effect it can be significant when the meter is used for custody transfer measurement. In order to estimate the influence of density on individual meters they would have to be proved gravimetrically on a number of different density oils. A laboratory with such a facility does not exist in Europe at this time.
2) As accurate weigh tanks are not available in the field, Coriolis meters can only be proved by using the small volume pipe prover with a density measuring instrument. However, the measurement of density is not sufficiently accurate to enable the combined uncertainty of the mass (volume and density) to meet the $\pm$ 0.2 percent requirement for custody transfer measurement.
3) The Coriolis meter is affected by vibration.

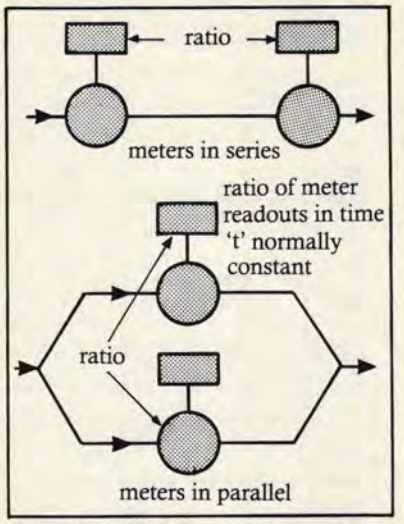


Figure 6: Monitoring: secondary control.

4) The area where direct mass meters could play a useful part is in the measurement of LPG, which is normally traded in mass units. However, there is no simple way of proving meters on this fluid in the field or in the laboratory.

There is evidence that the Coriolis meter may prove to be the future custody transfer meter for direct mass measurement of LPG and similar low viscosity products. It is also being used on refineries for the metering of low flow rates of materials such as lead alkyls. In this case, the accuracy can be controlled by monitoring the lead content of the gasoline blend. However, the problem of providing a dynamic mass prover which can operate under pressure conditions on site presents a stumbling-block to the employment of mass meters in activities controlled by regulatory authorities.

Density and sampling

For the foreseeable future it appears that mass will have to be measured by a combination of volume meters and density. Direct reading density meters have good repeatability but need accurate calibration. One method is to use high pressure pyknometers, although this requires highly specialised equipment and expertise.

Another method for improving the determination of density is by sampling and recording the temperature and pressure and then measuring the density in an Anton Parr meter in the laboratory at the same operating temperature and pressure. These conditions are reproduced by means of special equipment.

Flow computers

A recent development in flow computers has been in the use of graphical monitoring techniques. The information received by the computer from the meters is continuously analysed and displayed in the form of statistical control charts. These would include Shewhart Control Charts which plot meter factors against time, with upper and lower action limits based on 2 and 3 standard deviations respectively, Moving Average charts, which detect long term meter factor drift, and Cumulative Sum (CUSUM) charts, which indicate the occurrence of an 'event' due to some assignable cause. Monitoring programmes are employed for detecting changes in performance and can be used to plan maintenance schedules (see **Figure 7**).

Calibration

With conventional meters such as turbine and PD, which tend to change their accuracy with time due to bearing wear, it is essential to employ proving devices for checking and, if necessary, correcting the readout at regular intervals.

There are several different types of pipe prover such as the conventional (large volume) prover and the compact (small volume) prover. Conventional provers usually employ an over sized sphere or displacer and have mechanical detectors located approximately 20 metres apart. Compact provers employ a close-fitting piston with special high resolution optical detectors located about 1 metre apart. The objective of developing the small volume prover was to reduce its cost, weight, and installed space, and the volume of oil displaced in the proving operation. The compact prover, however, needs pulse interpolation in order to achieve the required 10,000 pulses (0.01 percent resolution).

The main advantage of the compact prover is in proving meters for delivering products to ships as it can be easily cleaned between grades and so eliminates contamination. Also it can be skid mounted and made mobile for use on jetties. However, the repeatability of the proving runs is usually poor compared with the conventional prover.

This could be due to pumping fluctuations. To overcome this problem, it is necessary to take four to five times as many runs in order to achieve the same uncertainty of the mean value as obtained with the conventional prover.

Traceability and codes

The Institute of Petroleum has recently set up a committee to prepare some guidelines on the traceability of pipe prover calibration. The uncertainty of

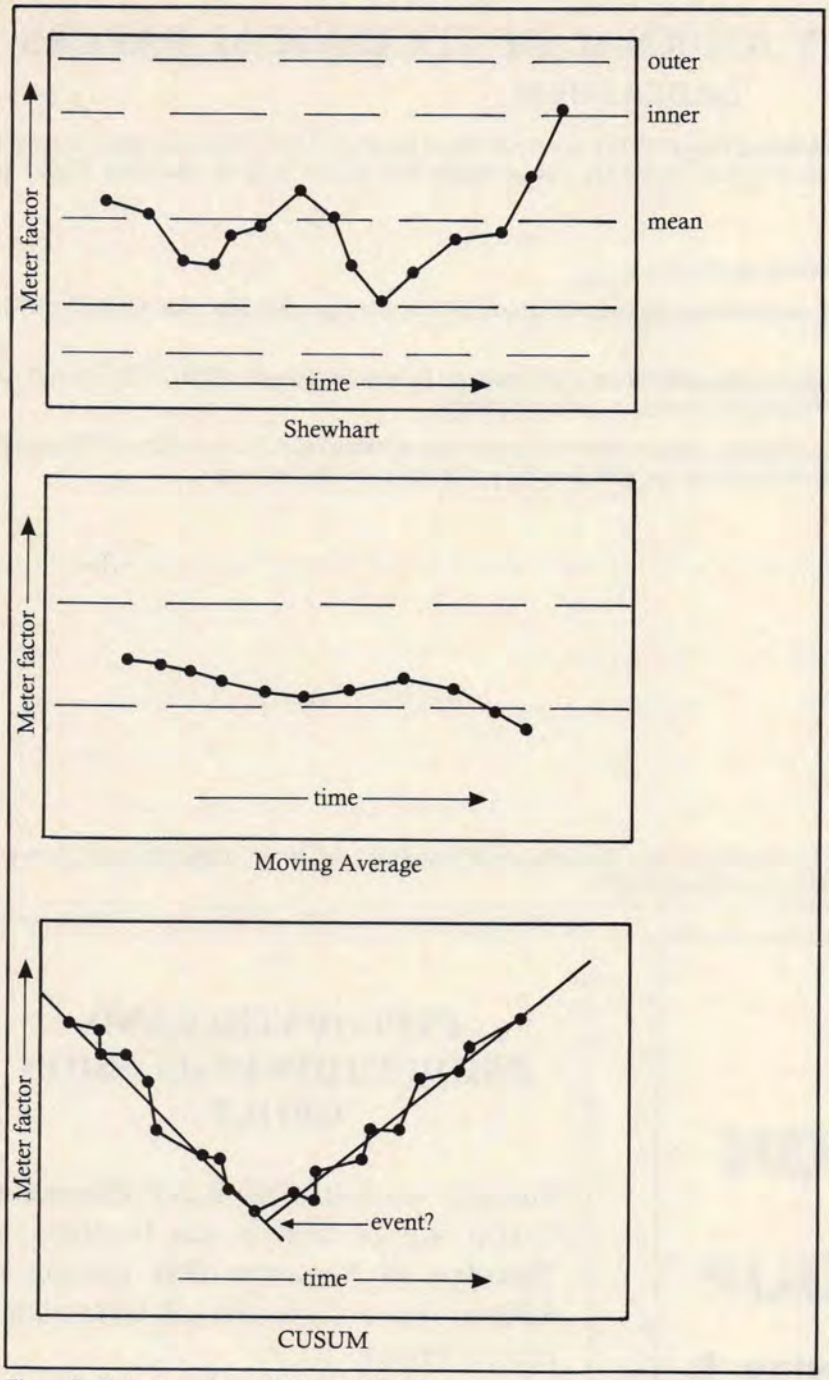


Figure 7: Flow computer: graphics: monitoring.

the primary measure contributes 60–70 percent of the overall uncertainty of the prover calibration. With conventional provers with relatively large volumes, the influence of the primary uncertainty is reduced when multiple pours (the number of times the primary measure is filled) are involved. The overall uncertainty is proportional to the primary uncertainty divided by the square root of the number of pours.

There is now a growing recognition that because small volume provers only involve one or two pours, the uncertainty of the primary measure becomes critical. A further problem is that the various Weights and Measure laboratories in Europe do not offer the same level of uncertainty when calibrating the same type of measure. There are two ways of overcoming this:

1) Use a gravimetric method involving multiple deliveries into a weigh tank.

2) Use a volumetric primary measure with a neck diameter of 12–20 mm and a bottom filling facility.

The accurate calibration of pipe provers used for proving import and export meters at the refinery is essential if acceptable reconciliation across the refinery is to be achieved. This means that in practice all the refinery provers should be calibrated by the same primary measures, which are in turn re-calibrated at regular intervals.

Measurement errors

It is possible to estimate the uncertainty of the meter throughput by combining, firstly, the short term errors (repeatability of runs at one proving) with, secondly, the long term error (the scatter of the means of provings at regular intervals) and, thirdly, the uncertainty of the pipe prover, in order to give an overall uncertainty. However, the most effective method is to compare metered volumes with tank transfer volumes on a cumulative basis. Ultimately a long term comparison between meters and tank quantities, expressed as standard volumes, should provide after 10–20 transfers a reconciliation of the order of $\pm$ 0.15–0.20 percent.

Future improvements

1) In order to achieve a better mass balance across the refinery, direct mass meters should be installed wherever possible but this requires the development of direct mass provers in the field.

2) Volume is generally well measured by existing meters but accurate on-line density is required to obtain mass. Density meters need calibration and thought should be given to checking by use of standard density liquids which are now available.

3) Wherever possible measurement data, such as comparisons between ship and meter quantities, should be monitored on a continous basis so as to provide early warning of meter factor drift.

4) Before installing metering systems it is essential that the design study should consider the relative cost and performance of the conventional and non-conventional meters. ■

Reference

**BS 7405 (1991): A guide to the selection and application of flowmeters for flow measurement in closed conduits,* British Standards Institution, September 1991.

The above paper was presented at the Fourth IP Loss Control Conference: October 1991.

QUARTERLY JOURNAL OF TECHINICAL PAPERS

ORDER FORM

The third issue of the **Quarterly Journal of Technical Papers 1991** is now available at a cost of £15.00, VAT zero rated. A copy of each of the papers which did not appear in *Petroleum Review* are now available free of charge to IP Members. Copies to Non-Members cost £5.00 per paper.
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IFEG

INFORMATION FOR ENERGY GROUP

The IFEG AGM and **wine & cheese party** will be held at 6.00 pm on Thursday, 5 December 1991. Please make a date for your diary.

For further information call **Catherine Cosgrove** on **071 636 1004** x 210.

EXPLORATION AND PRODUCTION DISCUSSION GROUP

The next meeting of the E & P Discussion Group will be held at the Institute on **Thursday, 28 November 1991** starting at **5.30pm.** (Tea and biscuits will be available from 5.00pm.)

Risk sharing with contractors on an EPIC (engineering, procurement, installation and commissioning) project

Speaker: **Mr K Bateson,** Head of Prospect Services, Shell UK Exploration and Production.

If you would like to attend this meeting please contact **Mr AE Lodge,** Institute of Petroleum, 61 New Cavendish Street, London W1M 8AR. Tel: 071-636 1004.

Pipe care specialist wins recognition for new concept

By Mark Scruton

A pipe care specialist from Aberdeen has won a £1 million contract from a Japanese steel mill for its patented Pipe Care Unit (PCU) — the first time a Japanese yard has awarded a pipe-finishing contract to a foreign company.

The containerised tubular service centre is to be installed in Nippon Steel's Yawata works — one of the largest steel mills in the world — at the end of this month. Once operational the equipment will process new pipe for a wide variety of Nippon Steel customers around the world.

Ramco Oil Services plc Chairman Mr Stephen Remp claims his innovative system has applications all over the world. In particular the mobile PCUs could be used to great effect in the Soviet Union — a country which desperately needs the flexibility the PCUs offer to provide some form of quality control and protection for its Oil Country Tubular Goods (OCTG).

The contract marks Ramco's first venture into the Japanese market. Although the company's traditional OCTG market in the North Sea is worth about £7–8 million a year, the Scottish-based firm has set its sights on diversifying further afield.

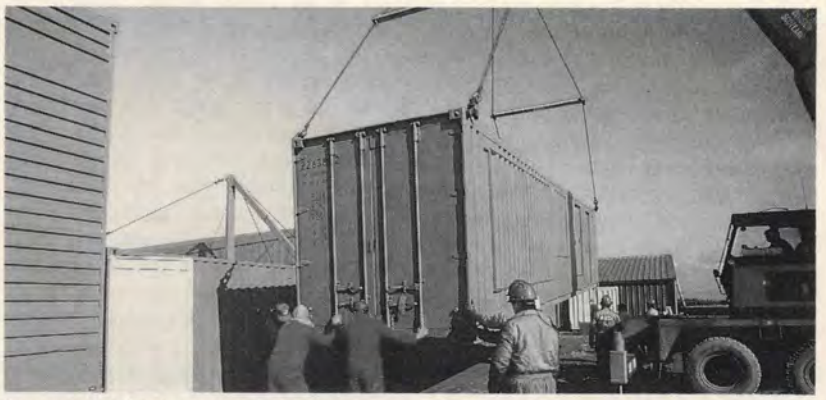
'The market tends to have poor standards internationally but it could change. Norway is about on the same level as the United Kingdom, but most other countries are not. There is potential growth in the international arena,' said Mr Remp.

Pipe care unit

In 1980 Ramco developed the concept of a $3.5 million tubular service centre (TSC) and set up the first facility in Aberdeen to provide cleaning, inspection and protection through the application of corrosion inhibitors for tubulars — production tubing, well casing and drill pipe.

In 1983 Mr Remp developed a new concept — a specialised self-contained automated tubular service system — after recognising the market potential for a mobile version of his company's fixed base TSC.

The purpose built $1.5 million PCU is highly mobile. It has a modular design; four standard ISO shipping containers house the process plant, which includes the automatic external shot blasting or power wire brushing equipment, internal blast lances, internal spray and drift lances and external coating equipment.



Ramco's PCU being unloaded at site.

A fifth container is fitted with the power pack, made up of a 900 cubic feet per minute (cfm) compressor, air cooler, dryer, receiver and generator, making the PCU a total independent facility. With integral grit recycling and dust recovery systems, plus weather protection modules for the most adverse conditions, the PCU also provides a controlled working environment.

At short notice a PCU can be shipped by road, sea or rail to wherever it is needed. Within 48 hours of arriving on site, the PCU with its five-man team can be up and running a tubular maintenance programme.

Talking about the concept Mr Remp said: 'We had a fixed base, very early on, but I thought there has got to be a better way to do this. We have got to have equipment that's flexible, that can move from time to time.'

The PCU has since proved so popular that the company now has seven: four in the United Kingdom, two in Norway and one which has just left for Japan.

Tubular finishing

The basic idea is to improve the safety and operating efficiency of oil and gas installations by cleaning, protecting and coating oilfield tubulars and pipelines.

Mr Remp believes that the emphasis on cost reduction and asset protection of the costly pipes means more and

more companies are acknowledging the benefits of clean pipe — for their budget as well as for a safer working environment.

The cost of tubulars alone — one of the three highest areas of expenditure in oil and gas exploration and production — accounts for between 16 to 25 percent of well completion costs.

A considerable amount of money — on the millions of dollars scale — is wasted because of careless handling and storage of pipe and poor pipe protection which can result in serious corrosion problems. The effect of dirty pipe can be devastating. Debris deposited in a well can lead to leaking threads or seals and difficulties in down-hole tube manipulation.

Even new pipe can cause problems because unless the mill-scale created during the manufacturing process is removed it can flake off down-hole. 'The steel pipes have scale on them, sooner or later that scale comes off and contaminates the tube,' said Mr Remp. If untreated this mill-scale contamination and other debris can collect at the bottom of the well and adversely affect well production or injection performance.

It is not only well performance that can be affected. Tubulars that do not make the grade can mean down-hole failure at the well site. In some cases the ramifications can be even more serious, leading to a blow-out. Either way, it can mean costly down-time on a rig or platform. As oil troubleshooter Red Adair acknowledged in a recent interview: 'When you've got your life on the line, you want to make sure you've got good pipe and good threads . . . . If you've got good, clean pipe, then you eliminate a lot of problems.'

Mr Remp said that aside from the safety aspects, this reduction in failure down-hole has given oil companies the opportunity to save millions of dollars. Gone are the days when old pipe was discarded. Now the TSCs can recondition used pipe so that it can be recycled on new wells.

Mr Remp said that by using TSCs the operators have seen tubular rejection rates fall from 30 percent to just 2 percent, with more than one million joints of tubing have been processed without a single failure down-hole.

'We recover and recycle tubes to as 'good as new' standards. Now about a third of all production tubing is run on recycled pipe', he added.

Global applications

Shell has demonstrated the benefits of using a TSC in the running of a facilities centre in Brunei. The TSC was originally set up in the middle of a huge supply base in 1981. Since then the facility has more than proved its worth to the operator.

'We have recycled and improved inventories of what would otherwise be scrap steel, saving millions of dollars,' said Mr Remp.

As part of a quality control programme set up by Shell, the facility was used to check any new pipe coming into Brunei from any source.

'The facility became the receiving plant for all new pipe into Brunei. All the pipe was cleaned and checked by TSC. We would not accept it if it did not come up to grade and this pipe was sent back to the manufacturers. It was costing them (the pipe manufacturers) their lunch. Very quickly manufacturers started sending good pipe knowing that all had to be sent through the TSC,' he said.

Mr Remp hopes his new mobile process will prove attractive to those anxious to improve the chronic problems in the Soviet Union where there are many poor quality, poorly protected Soviet-made pipes. 'The Soviet oil industry would make immediate savings if it introduced a programme similar to that which North Sea operators have been using for decades', he said.

Ramco's PCU in action.

Pipeline coating

Apart from tubular finishing, the company has recently set up a new business involved with pipeline coating. Mr Remp said: 'We started to see a new market evolve 18 months ago in the internal cleaning and coating of line pipe. We see this as a tremendous opportunity — water boards, oil companies, gas companies, any company concerned about corrosion is a potential customer.'

Using the PCU, liquid epoxy coating can be applied internally. This is not only environmentally friendly but has a very smooth finish and is very corrosion resistant. The system is capable of coating pipelines with diameters up to 24 inches.

Externally the line pipe is coated by the MPCP (Mobile Pipe Coating Plant) at the same time. A wholly-owned venture of Ramco's with British Steel, based in Hartlepool, has already started using this process. 'The plant uses the container concept, but is about five times the size,' said Mr Remp. The dual coating process is designed to be as efficient as possible.

'It deals with external coating using corrosion resistant coating for outside. This external coating is applied as a powder. Fusion Bonded Epoxy (FBE) powder. This talc-like substance is applied after the pipe is cleaned to a very high standard,' he said.

To apply FBE the pipe is heated using induction to 500°F and the powder is sprayed on as the pipe rotates. Because of electrostatic attraction the powder gravitates to pipe. The powder is applied in 10 seconds and hardens within 2 minutes.

With the acceptance of the PCU by the Japanese, the company is confident that its highly mobile pipe care unit concept will be accepted internationally. Even so the company has not turned its back on its traditional market, the North Sea. The company has only recently purchased a new 14.5 acre site at Badentoy, Aberdeen, the first step in creating a one-stop Tubular Service Centre. ■

Energy Economics Group

An evening meeting has been arranged on

Wednesday 27 November 1991 at 5.30pm.

Power generation: technological options for environmental compliance in existing and new plants

Speaker:
Mr Graham Weale,
Manager, WEFA Energy

For further information please contact: **Mrs J. Thompson**, The Institute of Petroleum, 61 New Cavendish Street, London W1M 8AR. Tel: **(071) 636 1004.**

The Institute of Petroleum

IP WEEK 1992

PROGRAMME OF EVENTS

Tuesday 18 February
Half-day IFEG morning conference on **'Oil Price Information'** at the IP **(Catherine Cosgrove)**

Tuesday 18 February
Luncheon at the Dorchester Hotel, London
Speaker: Mr Kenneth T Derr, Chairman and Chief Executive Officer, Chevron Corporation, USA (Caroline Little)

Tuesday 18 February
Evening meeting of IP London Branch at the IP
Speaker: Mr N J Tilling, Paramins Group, Exxon Chemicals on **'Trends in Automotive Fuels and Lubricants' (Edith Walker, Conoco Ltd. Tel: 071-408 6257)**

Wednesday 19 February
Annual Dinner at Grosvenor House, London **(Caroline Little)**

Thursday 20 February
Conference organised by the IP Energy Economics Group on 'Doing Business without Paper' The Impact of EDI (Electronic Data Interchange) on the Upstream and Downstream Oil Industry at the Cavendish Conference Centre, London **(Susan Ashton)**

Thursday 20 February
Evening meeting of the Exploration and Production Discussion Group at the IP **(Alan Lodge)**

For further information, please contact the above named individuals at the IP or Edith Walker at Conoco. Further information will be available shortly.

Institute News

Paul Frankel Award

Dr Paul Frankel presenting his award to Miss Cristina Caffarra in September at the IP.

Miss Caffarra is studying at the Oxford Institute for Energy Studies, after receiving her first degree in Italy.

Staff changes

Mrs Jean Etherton, Head of Library/Information Department is to leave on 15 November after nearly 15 years with the Institute. Mrs Catherine Cosgrove has been appointed as the new Head of Library/Information from 1 November. Mrs Julia Clark has been appointed as an additional Information Officer.

Mr Bob Edmondson, formerly with Foster Wheeler, started at the Institute on 1 October in the new post of Education Liaison Manager.

Miss Paula Higgs joined the IP as Technical Assistant on 1 August. In this role she will be responsible for providing the secretariat services for the BSI PTC/13 Test Methods Committee.

Benevolent Fund

The Institute of Petroleum has a Benevolent Fund for the provision of financial and other relief or assistance to persons in need who are or have been members of the Institute and the wives, widows, families and dependent relatives of such persons as the Management Trustees in their absolute discretion think fit. If members of the Institute are aware of any such persons, even if their membership of the Institute has ceased, they are asked to inform Mr Ian Ward at the Institute. Applicants would be asked to complete a form giving details of their financial circumstances which would be treated in strict confidence. Help might be given for temporary difficulties, such as the cost of convalescence following illness.

Around the Branches

Aberdeen
12 November: 'North Sea Safety', Tony Barrell, Health and Safety Executive.
22 November: Annual Dinner — Guest Speakers: Mr John Collins, Chairman of Shell UK and Mr Richard Coe-Hamilton, Chief Executive, Clydesdale Bank Plc.

Edinburgh and South East Scotland
7 November: 'Prospects for Renewable Energy in Scotland', Mr R Morris, Group Head, Energy and Environmental Technologies, Scottish Enterprise.
12 December: 'Environmental Audit — The plain facts!', Dr P Upton, Manager, Dames and Moore UK (joint meeting with the Pipeline Industries Guild).

Essex
13 November: Ladies Evening — 'Wines of Europe', Mr PA Gibb, Branch Manager, Peter Dominic Ltd. Followed by buffet supper.

Humber
28 November: 'Eurocell Project', Mr RJ Bass.

Irish
14 November: Annual Dinner.

London
14 November: 'Piper Alpha and the Cullen Report — The Aftermath', Dr BGS Taylor, UK Offshore Operators Association.

Malta
19–22 November: 'Clean Seas 91 Conference' co-sponsored by IP Malta Branch.

Midlands
13 November: 'Diesel Emissions', Dianne Hall, BP International.
6 December: Greek Night Out.

North East
12 November: 'Gas from the North Sea to Teesside — A description and progress report on the Amoco CATS project', Mr D Nelsen, Amoco.
12 December: 'Quality Assurance in TQM', Mr SRR Kirk, ICI Ltd.

Northern
12 November: 'Futures and the Spot Market', Mr G Watson.
29 November: Dinner Dance, guest speakers Mr Basil Butler OBE, President of the IP and Mr T Wilkinson, Chairman of Blagden Industries plc.

Southern
22 November: 'Defence Procurement', George Eynon, Woolwich.
3 December: 'Safety Year 1992', Dr Waldridge (joint meeting with IEE).
13 December: Visit to the Ordnance Survey.

Stanlow
27 November: 'Fast Track Project Management', Mr H Wang, Shell UK Oil (joint meeting with IChemE).
29 November: Annual Dinner Dance.

Shetland
1992
18 February: AGM.

South Wales
21 November: 'Expert Systems in the Oil Processing Industry', Mr P Andow, KBC.

West of Scotland
1992
6 March: Petroleum Dinner.

Yorkshire
12 November: 'BS5750 Quality Assurance — An Assessors Point of View', Mr I Hodgkinson, Development Manager, Lloyds Register LRQA.
10 December: A visit to Ackrill Newspapers — 'Aspects of producing the Harrogate Advertiser'.

Institute News

Shetland visit

Val Turner explaining an ancient stone implement to (from left) Andrew Wylie, branch Chairman Jeremy Procter, IP member John Robertson and Angus Smith.

It was the Reverend Angus Smith's first taste of the 'sharp end' of the business as the new oil industry chaplain when he visited Sullom Voe Terminal and offshore related activities in Shetland.

Rev Smith was accompanied on his trip by his predecessor Rev Andrew Wylie, a Fellow of the Institute and both attended the IP branch meeting at the Maryfield Hotel, Bressay. The forty members present were given a fascinating account of current archaeology activities in Shetland by Shetland archaeologist Val Turner.

New Collective Member

Ingres Limited, Anchor House, 15–19 Britten Street, London SW3 3TY. Tel: 071 895 9160. IP Nominated Representative: Ms Louise Wilde, Business Development Manager, Oil & Gas.

Ingress Limited is a subsidiary of ASK Computer Systems Inc, of Mountain View, California, USA. The company provides a database, tools and networking software, specialising in the supply of software for the petroleum industry.

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Student Prize Winner

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Student

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Mr Nzima, ET, University of Swaziland, P/B 4 Kwaluseni, Swaziland, Southern Africa

Deliveries into Consumption

UK deliveries into inland consumption of major petroleum products — Tonnes — August 1991

Products	*Aug 1990†*	*Aug 1991**	*Jan–Aug 1990†*	*Jan–Aug 1991**	*% change*
Naphtha/LDF	309,620	207,920	2,050,220	2,241,670	9.3
ATF—Kerosine	653,490	636,480	4,495,090	4,039,120	−10.1
Motor Spirit	2,178,540	2,099,650	16,376,740	15,984,980	−2.4
of which unleaded	761,580	870,340	5,302,070	6,418,350	21.1
Super unleaded	88,910	104,320	598,110	754,340	26.1
Premium unleaded	672,670	766,020	4,703,960	5,664,010	20.4
Burning Oil	187,990	135,420	1,361,560	1,505,900	10.6
Derv Fuel	929,950	864,900	7,150,370	7,043,570	−1.5
Gas/Diesel Oil	623,450	594,520	5,393,400	5,386,230	−0.1
Fuel Oil	881,871	1,018,660	9,270,017	8,324,450	−10.2
Lubricating Oil	74,754	63,490	550,650	511,900	−7.0
Other Products	423,385	594,890	4,184,823	4,279,660	2.3
Total above	6,263,050	6,215,930	50,609,510	49,317,480	−2.6
Refinery Consumption	501,260	524,490	3,968,870	4,026,810	1.5
Total all products	6,764,310	6,740,420	54,578,380	53,344,290	−2.3

†Revised *Preliminary

. . . technical report

Exploration and Production

The Code of Practice on 'Well Control during the Drilling and Testing of High Pressure Offshore Wells' has reached a sixth draft stage. The Association of Wellhead Equipment Manufacturers, the International Association of Drilling Contractors, operating companies and the HSE have agreed pressure testing methods for 15,000 psi blow out preventers.

A Task Group has been set up to examine subsea wellhead/wellhead connector/blow out preventor systems used for deep water and/or high pressure well applications.

The Oil Muds Code of Practice has now been finalised and will shortly be passed to the publishers.

Refining and Marketing

A full draft of the Fire Precautions Code was considered by the Working Group. Further, substantial editing will be carried out before its submission to external parties such as HSE etc for comments.

Work has started on the preparation of a separate document on Work Permit Systems. Both the refining and marketing sectors of the industry are jointly participating in the work.

Preparation of a Code dealing with Bulk Storage and Transfer Facilities will commence when the composition of the Working Group has been finalised.

The Safety Committee was canvassed on its future role and activities. Strong support for the committee was received and terms of reference are being drafted.

In view of the number of exchange and third party agreements involving driver pickup of product at a variety of locations, the Marketing Committee is seeking to achieve greater compatibility in emergency pump shut-down arrangements at marketing installations.

Following representations with others, to the Department of Transport the inappropriateness of high level outline marker light 'stalks' on road tankers has been recognised. The lights will now be mounted at chassis level.

The Marketing Committee has provided comments on the HSE draft regulations for 20 litre plastic containers.

Panel C has visited Scandinavia to inspect vehicles built to ADR standards, which permit chassis earth return, and to witness vehicle stability tests.

The Electrical Committee has produced a draft specification for radios in road tanker cabs. A working group has been established to deal with area classification issues.

Representatives of the Aviation Committee have witnessed international tests of aviation filters.

Through its international membership the Aviation Committee has approached airlines and aircraft manufacturers regarding problems related to breakaway couplings. It has also been involved with aviation authorities, concerning selective overwing filling orifices.

Measurement

The IP has continued submitting comments on API and OIML draft Measurement Standards, moving towards the issue of joint IP/API Standards in this area. However separate Codes will continue to appear for some time yet.

The publication: *Recommended UK Operational Practice for the Proving of Gantry Meters Fitted with Electronic Heads*: will be published at the turn of the year.

Ballot returns are being compiled for the Petroleum Measurement Paper: *Guide to Coriolis Direct Mass Flowmeters*. These will be reviewed prior to the final ballot to the Petroleum Measurement Committee and API in the fourth quarter this year. Publication will be in 1992. This will be the first comprehensive guide on the application of mass flowmetering.

The Fourth Oil Loss Conference dealing with the control of losses in refineries took place on 30/31 October 1991, including detailed annual refinery loss data covering all the major oil companies. The results of analysis of this data formed a focus for the Loss Conference.

Standardization (Test Methods)

Revision of the current IP Test Method Book has been completed and the revised text together with new proposed and full methods have been submitted to John Wiley for publication.

The new ballot procedure, adopted by the Method Evaluation Sub-committee, for approving for publication new and fully revised methods, has proved to be a great success and will be continued.

The agreement for the IP to take over the responsibilities for the secretariat of the BSI PTC13 Test Methods committee has been signed. The transfer of the secretariat responsibilities to Paula Higgs has commenced.

Specification methods which can be called up in the new CEN Fuels and Bitumen specifications are being developed.

Health and Environment

The Institute epidemiological study of Refinery and Oil Transportation workers has been finalised and will be published in early November. A paper on the study results will be presented at the International Symposium on the Health Effects of Gasoline — 5–8 November in the United States.

A successful one day conference 'Automotive Fuels — Environmental and Health Implications' was held at the Institute on 9 October.

The first stage of the research project to investigate the bioavailability of carcinogens from oil has been successfully completed by BIBRA. The final definition of the second stage of the study is now underway which will use the techniques developed to examine the effects of variation in physical properties of oil.

J Hayes, Technical Director

Effective rheology control

Drilling Specialties Company has developed Drill-Thin™ dispersant, a superior chrome-free mud conditioner. Laboratory tests have shown the new product to be four to twelve times more effective for controlling rheology than either lignosulfonate (CLS) or chrome-free lignosulfonate.

'Drill-Thin, our new dispersant, differs chemically from conventional lignosulfonates,' said Bharat Patel, laboratory manager for Drilling Specialties. 'Drill-Thin gives more effective rheology-controlling performance than chrome lignosulfonate, with environmental acceptability similar to that of most chrome-free thinners,' he added.

'Drill-Thin performs better than chrome lignosulfonate at one-fourth the concentration in drilling mud formulations tested. This product is so effective, it can be used in quantities ranging from as low as one-tenth pound-per-barrel (ppb) to two ppb for most muds.'

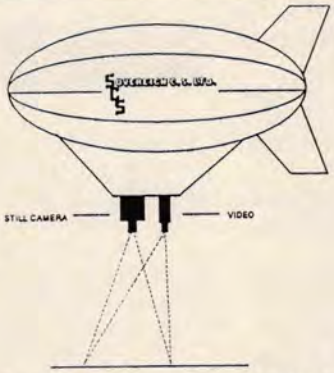
Independent laboratory tests show Mysid shrimp (*Mysidopsis bahia*) exposed to the suspended particulate phase (SPP) of a generic mud, containing 4 ppb Drill-Thin, to give 96-hour LC50 values of 100 percent (1,000,000 ppm). Regulations proposed by Environmental Protection Agency (EPA) state 96h LC50 values less than 30,000 ppm, to be toxic and unacceptable. The highest attainable value (best) is 1,000,000 ppm (100 percent).

Unlike CLS and chrome-free lignosulfonates, Drill-Thin is readily soluble in either fresh or salt water without requiring the use of caustic soda for pH adjustment. It is also effective in lime and gyp mud systems.

Drill-Thin dispersant is neither temperature-dependent nor pH-dependent. The product is active and stable over a wide temperature range and reduces corrosion inherent with many drilling fluids. It also breaks excessively high gel strengths in salt-water muds, reduces the natural foaming tendencies and lowers water loss.

Drill-Thin is currently available in 25-pound bags in the United States and will soon be marketed internationally.

Novel aerial survey



A combination of a specially equipped airship and computer technology are part of a new package being offered by Middlesex-based firm Sovereign CS Ltd for site surveys.

The novel aerial approach is claimed to reduce costs to a quarter of a conventional survey and to produce it in a quarter of the time.

The firm initially decided to use an airship in a bid to produce a survey plan for a specific development plan without having to implement a full topographical survey.

Sovereign decided that aerial photography could be a solution but, because of limitations on aircraft operations in the area imposed by the Civil Aviation Authority, the company looked at using model aircraft and balloons with cameras.

By elimination, the balloon proved to be the best solution meeting all the company's criteria as well as providing a stable platform for the remote operation of the airship's equipment.

This equipment, an aerial photography system developed by Sovereign, included a remotely operated Nikon camera, video camera and a microwave transmitter linked to a ground receiving station.

This system is able to see (and record) the area of interest and take controlled aerial photographs at up to 60 metres in conjunction with a minimal ground control traverse collection via a computerised electronic tachometer.

The resultant survey data is produced in a CAD system, the aerial photographs scanned in and rescaled to survey control points, optically corrected for angles and lens distortion through the firm's own OPTISCAN and CADCAL programmes and a site survey plan is produced to a relatively high accuracy. The system is ideal for oil companies because the detail from these surveys can then be added/merged or superimposed with other data, such as hydrographic or 3D seismic surveys for subsequent solid modelling.

Heat tracer

The Thermo Tracer, a non-contact thermal imaging system, is ideal for accurately measuring and monitoring exact temperatures — overall or at any precise point(s).

It can display accurate simultaneous heat profiles of large areas and objects allowing direct comparisons (overall heat profiles of complete buildings, air conditioning system, processing equipment and systems etc) or pinpoint and plot the temperature profile of small areas, such as individual points (even down to a single component) in these systems. Heat measurement can locate high or rising temperatures and warn against imminent dangers and help avoid costly problems at a later data.

Oil rig safety

DMC, the Arbroath-based multimedia company, unveiled a prototype of its newest system at Offshore Europe in September. MORSE, the Multimedia Oil Rig Safety Environment, is intended to make working in the North Sea safer.

Touch-screen monitors in a PC-based system with a video digitising card connected to cameras allow users to see behind safety doors and find out if exits are safe. Existing data acquisition information is shown in a graphical form and a key part of the display is an icon-based map showing safe evacuation routes and any known hazards.

A central operator can send messages to each or all of the terminals and also has access to more detailed maps and information on the location of personnel.

Australians extract oil with bacteria

Australian petroleum industry scientists have made a significant advance in the technology of extraction of oil from existing wells. They have devised a process that uses bacteria already existing in oil wells. The life-cycle of the bacteria provides a natural detergent that frees oil from the spaces between earth particles so that it can flow freely out of the well when water is pumped in to provide pressure.

In the past, gas or water treated with chemical surfactants has been pumped into wells to try to extract oil when the initial gusher has faded away.

Although this does enable the extraction of some oil, it still leaves much in the ground, which in the past it has not been possible to recover.

On a global average, production from an oil reservoir usually ceases when only 30 percent of the oil has been brought to the surface. This figure can vary from well to well depending on the geology.

The surfactants used in the past are minimally biodegradable and can pose environmental hazards in the long run.

The bacterial surfactants developed after 10 years of research by team from the Microbiology Research Unit, a joint facility of the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and the University of Canberra, have been dramatically tested in trials on Queensland's Alton oilfield.

The trial was able to boost production by about 50 percent for the year with no end in sight for the increased flow.

The researchers injected the Alton well with a solution enriched with natural bacteria extracted from the oil reservoir. The technique extracts bacteria, provides them with nutrients so that they will grow and multiply in a controlled environment and then returns them to the oil-bearing rocks far below the surface.

ESD valve testing

A new, specially engineered system for the internal leak testing of emergency shutdown (ESD) valves in accordance with the Emergency Pipeline Regulations was launched by Furmanite at the recent Offshore Europe exhibition.

Designed to provide accurate on-line measurement of the leak rate past ESD valves, the Furmanite ESD Valve Internal Leak Testing System fully conforms to the requirements of SI 1989/1029 by enabling a full differential pressure test to be carried out on each valve.

The system, which is provided as a service, works by introducing an isolation device, in the form of an inflatable bag, into the pipeline on the platform side of the ESD valve to create a sealed internal cavity behind the valve into which any leaking gas or oil collects for measurement.

Introduction of the isolation device requires only a minor modification to the pipework in order to create an entry point.

£2m SANA contract

The Oil Field Developments (OFD) subsidiary of Midland & Scottish Resources has awarded Ingersoll-Rand an order worth over £2 million for compressors and pumps for the SANA 15,000 floating production facility (FPF). London-based OFD has a supply contract with its sister company, SANA, for production equipment to be incorporated in the FPF.

The SANA 15,000 FPF when delivered, will have the largest production capability of any floating facility in the world. It is scheduled for delivery in June 1993. The contract from SANA for construction of the hull has been awarded to Fincantieri, the Italian state-owned shipbuilding company, and is being undertaken at the Sestri Ponente shipyard in Genoa and at various yards throughout Italy.

Based upon the principle of displacement, the Minimax tank gauging system provides accurate level measurement to ± 0.9mm absolute, within an operating range of up to 25 metres. A new concept in level measurement from Endress + Hauser, the gauge is suitable for both atmospheric and high pressure measurement applications up to 25Bar.

A small displacer is accurately positioned in the liquid using a servo motor. The displacer is suspended on a fine stainless steel wire, which is wound onto a precision drum. The drum is driven via two coupling magnets, completely separated by the drum housing. The magenetically coupled drive isolates the wetted parts from the motor and electronics, eliminates the need for bearings and reduces wear and tear.

As the liquid level changes with process conditions, the change in displacer weight is detected by the unique, magnetically coupled, torque detector. The Minimax tank gauging system uses this technique to provide interface level, tank bottom and density measurement.

Both level and temperature can be displayed on the gauge and, if required, a remote indicator can be mounted at the base of the tank. Several output signal options are available to enable remote indication and control.

The versatile minimax system can be expanded to form part of a comprehensive tank farm complex, where a multi-data processing unit allows up to 140 tanks to be monitored and managed simultaneously.

Miniature sonar

A scanning sonar with a sub-miniature underwater scanning unit weighing less than half a kilogram is now available from MK Services Ltd.

The Imagenex Model 855 colour imaging sonar gives a clear image of underwater installations up to 90m away, or a plan view of the seabed many metres in diameter.

The underwater unit is built into a rugged, sub-miniature package 9.6cm long × 8.9cm diameter, depth-rated to 300 metres. The small size enables it to be used in many applications where larger units are impractical.

Adjustable drill

Smith International Inc has developed an addition to its Dyna-drill product line – an adjustable con-rod housing for steerable or horizontal drilling applications. This permits the directional driller to change the tool's deflection angle at the rig site, reducing costly down-time.

As well as this latest Dyna-drill motor product, the Houston-based company claims its range, all of which work by converting the hydraulic energy of drilling fluids into mechanical energy allowing them to rotate independently of the drillstring, also results in significant cost savings in straight-hole, directional, steerable and horizontal drilling applications.

Advanced kick system

A breakthrough in the detection of potentially lethal gas kicks during drilling operations is being demonstrated at Aberdeen's International Drilling and Downhole Technology Centre.

Teleco Oilfield Services have brought their new Gas Influx Detection equipment from the United States, where it was designed, to Scotland for practical testing and demonstration.

The trials are being carried out in one of the few open access vertical wells in the world and the only one in the United Kingdom, which can simulate gas 'kicks'. They have proved that the new system can detect gas up to 15 minutes in advance of current methods used on and offshore in the drilling industry.

The leader of Teleco's project team, Tom Bryant, said: 'The Gas Influx Service is unique and, we believe, will reduce the chances of blowouts occuring on and offshore dramatically. Our tests here have shown that our system can detect gas at least 15 minutes faster than conventional methods, allowing far quicker preventative action to be taken in a potentially dangerous situation.'

Minister visits Hayward Tyler

Energy Minister Colin Moynihan MP got the low-down on the Forsac valve when he visited Luton-based Hayward Tyler Fluid Dynamics' stand at Offshore Europe '91 in Aberdeen.

The ESDV valve is designed to cut the flow of oil or gas to an offshore production platform in the event of an accident, improvements in safety provision being one of the key topics under discussion at the event.

The valve has a special isolation sleeve which greatly reduces the time and expense of recovery for servicing and allows a full test of seals and seats to be carried out with the valve *in situ* in the pipeline.

Mr Moynihan is pictured with Roger Harrop, Hayward Tyler's Chief Executive and Chairman, who explained the valve's workings using a miniature model of the valve: the real thing weighs 35 tonnes.

Technology news Contact List

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Mobil	071 828 9777 xtn 2065
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Ingersoll-Rand	0800 282040
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DMC	0241 78078
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Teleco Oilfield Services	0224 325326
CSIRO (Austrade)	071 438 8535
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New scan system

Du Pont NDT Systems of St Neots announce the availability of PipeScan, a new low cost, easy to use, portable colour imaging system for mapping corrosion and flaws inside pipework installations.

PipeScan is similar to the recently introduced PortaScan system for precision 100 percent non-destructive testing of large areas of metals and composites. With PipeScan however, the precision scanner is, in effect, wrapped around the outer surface of pipework under test.

The scanning unit is attached by flexible toothed belts to the curved surface and is manually indexed around the circumference while the spring loaded ultrasonic probe is scanned backwards and forwards over the pipe on its precision carrier.

Digital ultrasonic data and positional information are fed to a data acquisition interface in the computer and detailed images of the inner surface of the pipe or component are built up as scanning takes place.

Cyclone measures

Cyclone 2200 is a new flow metering product from Rosemount, with its principal target applications being the measurement of low viscosity products such as white oils, lube oils and solvents.

Cyclone 2200 presents a 'fresh solution' for bulk terminal, commercial fuel oil tanker, truck and aircraft re-fuelling and other general oil measurement applications. It has been developed with high accuracy, reliability and low cost as its principal features.

Data analyst

A new software programme can help bring to light information about field production normally left hidden in computer databases.

IXL, the database analysis tool from Los Angeles-based IntelligenceWare, uses machine learning techniques and artificial intelligence to search automatically databases about fields to find previously unknown patterns and relationships in the data.

IXL, or Induction on Extremely Large Databases, then presents these newly found discoveries in a series of English-like statements which could help predict the field's future production results from the masses of data acquired in proprietary oil company databases.

Dr Kamran Parsaye, President of IntelligenceWare said: 'There will never be enough human analysts to analyse all this data; software technology is the solution.'

Superior lube

Mobil has developed a new lubricating oil which gives outstanding protection to high performance diesel engines used in severe conditions.

Called Delvac XHP 15W/40, Mobil claims it reduces breakdowns associated with oil problems and improves engine performance for longer periods by reducing engine wear.

The oil contains top quality, highly refined hydrocracked base oils which provide superior low temperature fluidity and high temperature viscosity retention and volatility control compared with conventional mineral oils. The superior low temperature fluidity – said to be only half the viscosity of conventional oils at $-25^{\circ}C$ – results in more rapid oil distribution leading to easier engine starting in cold weather.

. . . people

McDermott Marine Construction have appointed **Mr Jim Franklin** as General Manager, McDermott Scotland. He assumes the responsibilities of **Mr Mike Pearson** who has been reassigned and named Vice President, special projects for the North Sea, Middle East and West Africa Group of McDermott Marine Construction.

Professor John Archer, above, has been appointed the new Pro Rector at Imperial College of Science, Technology and Medicine. Mr Archer will continue his activities as Professor of Petroleum Engineering and Head of the Department of Mineral Resources Engineering at the College.

Mrs Elaine Gillatt, above, has been appointed Industrial Sales Manager with Elf Oil Ltd Mrs Gillatt is a member of the IP Council.

Environmental Auditors, a subsidiary of the property management consultancy company Central and Provincial Management Limited has been established to provide environmental audits and environmental impact assessments. The new company will be managed by **Mr Mark Hadley,** a member of the Institute of Petroleum.

Mr John Pike, above left, Media Relations Manager of Shell has retired after 36 years with the company. Shell UK have appointed **Ms Fran Morrison,** above right, as Head of Media Relations in his place. Before joining Shell, Ms Morrison spent 15 years with BBC TV, Radio News and Current Affairs as a reporter and presenter. She has recently been working as a freelance consultant to a wide range of corporate clients.

Following the deaths of **Mr Colin Lee, Mr Kent Bowden and Mr William Dietrich** in a plane crash in Malaysia, Conoco Inc have made the following appointments: **Mr Gary Edwards** as Executive Vice President, Refining, Marketing, Supply and Transportation; **Mr Robert McKee** as Senior Vice President Administration and **Mr Harry Sager,** Executive Vice President, Exploration and Production assumes responsibility for exploration and production in North and South America, Asia Pacific and Middle East.

Mr Roger Hollerton, below, has been appointed Business Development Manager for Marley Cooling Tower Company (Europe) Ltd. The company has been established to serve the expanding power generation and heavy industrial cooling needs of the United Kingdom and European continent.

Mr V Ray Harlow has been appointed President and Managing Director of Sun International Exploration and Production Company Limited. Mr Harlow was formerly Area Exploration Manager for Sun's oil and gas exploration interests in Central and South America and Sub-Saharan Africa. He has worked for the company since 1987, joining Sun from Hyde Oil and Gas Company. Mr Harlow will report directly to the newly appointed Sun Company Group Vice President **Mr Robert H Writz Jr.**

Mr Graham Lord, below, has been appointed to the position of Senior Quality Control Inspector (mechanical equipment) by Amoco Norway Oil Company. Mr Lord joins Amoco from Verilec Norway and Metal and Pipeline Endurance Ltd.

Gaffney, Cline & Associates (GCA), the petroleum and energy advisory company, have opened a new representative office in Budapest. As Area Manager of their first Central European office they have appointed **Dr Dan Havlena.** Dr Havlena previously managed GCA's Canadian office in Calgary.

GH-Bettis have appointed **Mr Geoffrey Blanford,** above, as Managing Director of GH-Bettis Actuators and Controls Limited. Mr Blanford was formerly Managing Director of a pipework fabrication company supplying equipment to the petrochemical/chemical industry.

Dr Mal Prodger, above, has been appointed by North East Corrosion Engineers Limited to head their oilfield chemistry division. Dr Prodger was previously European Manager of the oilfield chemicals specialist, Petrolite.

Mr Paul Tempest has been appointed Director General Designate of the World Petroleum Congresses. He was formerly Head of International Energy Policies Division of Shell International Petroleum. Mr Tempest has also been actively involved in the British Institute of Energy Economics and the International Association for Energy Economics.

OFFSHORE INSTALLATIONS INSPECTORATE

ABERDEEN UP TO £40,127

SECURING OFFSHORE SAFETY

The Health and Safety Executive's Offshore Safety Division (OSD) has the challenging task of securing improved safety legislation offshore, including implementation of the recommendations of the Cullen Report on the Piper Alpha Disaster.

OSD is expanding rapidly to fulfil this role and wishes to increase the number of specialists based in Aberdeen. OSD's staff in Aberdeen will shortly move to new premises in the city in order to accommodate the expansion, and we need more professionals in many disciplines who can meet demanding objectives.

A VITAL AND REWARDING JOB

We require engineers and other specialists of the highest calibre to undertake the work of OSD in Aberdeen. You will play a vital role in promoting higher standards of safety, health and welfare offshore, and in assuring the safety of wells, pipelines, diving activities, offshore installations, and associated systems.

You will advise on technical policy, and will influence the development of legislation, standards and guidance both for the UK and world-wide.

It is a challenging and rewarding job for those with the required qualifications and experience, who are willing to broaden their technical knowledge with further training, experience on the job and contact with developments world-wide.

YOUR BACKGROUND

For these posts, you should normally possess a degree in a relevant discipline or corporate membership of an appropriate professional institution. However, absence of these qualifications need not disqualify you if you are able to offer specialist expertise particularly relevant to the task of OSD in Aberdeen.

You should also have had several years experience in a responsible position in industry, ideally in, or related to, the offshore petroleum industry in UK Controlled Waters. Consideration will also be given to those with relevant experience in the management of major hazards in other industries.

A mature outlook and good interpersonal and communication skills are vital in these roles which demand open minds and forward thinking.

SECURING OFFSHORE SAFETY

COMPREHENSIVE TRAINING

A programme of training and professional development will broaden your technical expertise, provide a thorough knowledge of relevant legislation, and develop the new skills needed for the job.

THE REWARDS

Salary will be within the ranges £27,108 to £32,982 or £30,493 to £37,100 (as shown below) depending on qualifications and experience, with further increments, up to £37,100 or £40,127 depending on performance. All salaries are currently under review.

Relocation assistance up to £5,000 may be available, and other assistance may be given additionally in certain circumstances.

POSTS AND LOCATION

In these posts you will be involved in the assessment of safety cases for offshore installations; auditing of companies' safety management systems; inspection and audits on offshore installations; accident/incident investigation, including the day-to-day enforcement of the relevant legislation; contributing to the development of new legislation, guidance and standards.

They are mobile grades and the starting location will be Aberdeen.

HSE
Health & Safety Executive

The Health and Safety Executive is an equal opportunities employer and is firmly committed to equal opportunities policies. All suitably qualified applicants will be considered on the basis of merit irrespective of gender, ethnic origin, marital status, religious belief, age, sexual orientation or disability. Applications are particularly welcome from women and people from ethnic minorities.

appointments

WELL OPERATION CONSENT INSPECTION **UP TO £37,100**

You will evaluate proposals for well operations, recommend consents and examine the elements of offshore safety cases relating to well operations. You will seek to ensure that all such activities are carried out in accordance with licence conditions and good oilfield practice.

You will also assist in the investigation of accidents and equipment failures, monitor experience abroad and develop criteria for use in relevant standards and safety case assessments.

DRILLING/WELL OPERATION INSPECTION **UP TO £37,100**

You should have extensive well operations experience with a major petroleum company and have knowledge of drilling plant, systems and operations.

You will conduct inspections and carry out investigations of incidents on a wide variety of offshore installations. You will also assess the safety cases produced for these facilities which include mobile drilling units, fixed and floating production and accommodation units, and pipelay barges.

ELECTRICAL/MECHANICAL/CHEMICAL ENGINEERING INSPECTION **UP TO £37,100**

Other than experience in the offshore petroleum industry, such as electrical power generation, mining, nuclear or petro-chemicals may be acceptable for these posts.

You will conduct inspections and carry out investigations of incidents on a wide variety of offshore installations. You will also assess the safety cases produced for these facilities which include mobile drilling units, fixed and floating production and accommodation units, and pipelay barges.

PROCESS AND OTHER OPERATIONS INSPECTION **UP TO £37,100**

You will conduct inspections and carry out investigations of incidents on a wide variety of offshore installations. You will also assess the safety cases produced for these facilities which include mobile drilling units, fixed and floating production and accommodation units, and pipelay barges.

PIPELINE CONSTRUCTION ASSESSMENT AND INSPECTION **UP TO £32,982**

You will carry out assessments of the design, construction, operation and maintenance of pipe-lines both onshore and offshore. This will include construction and operational inspections and the investigation of incidents. You will also review pipeline owner's inspection schemes and quality assurance systems.

You will examine the pipeline related aspects of safety cases and represent HSE on research projects to promote the safe design, construction and operation of pipelines.

DIVING INSPECTION **UP TO £32,982**

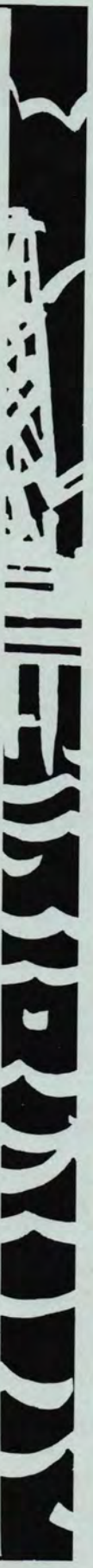
You will conduct health and safety inspections of diving operations to ensure that they comply with legislation and you will investigate accidents and incidents.

You will also examine the diving element of safety case submissions, contribute to the examination of company safety management systems, and monitor training schools.

You will also represent the HSE on research projects to establish safer diving operating procedures and techniques.

HOW TO APPLY

For further details and an application form (to be returned by 29th November 1991) write to Recruitment and Assessment Services, Alencon Link, Basingstoke, Hants RG21 1JB, telephone Basingstoke (0256) 468551 (answering service operates outside office hours) or fax 0256 846374. **Please quote ref: B/92/1256/ P.R.**



1992 IP Diary

Orders are now being taken for the 1992 IP Diary. The leather covered diary has the IP crest (as above) reproduced at the top with the date and gives ample space for a company logo to be embossed underneath. The diary will be available in late Autumn.

The colour of the cover will be burgundy.

The diary contains 32 pages of specially printed copy, including oil industry statistics collected by the Institute of Petroleum.

The cost for a single diary is £6.50 (incl. p&p and VAT) and £7.50 overseas.

Discounts are available for bulk orders as follows:

25–49 diaries: £4.75 + VAT each
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Embossing of company logos is available at extra charge.

Enquiries and orders should be made to:

Susan Ashton, Institute of Petroleum,
61 New Cavendish Street, London W1M 8AR
Telephone: 071 636 1004. Fax: 071 255 1472
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The post is presently London based but is likely to be re-located to the Bath area in the foreseeable future. Relocation assistance up to £5000 may be available.

You should normally be a Chartered Chemist or Chartered Mechanical/Chemical Engineer and have extensive experience in Petroleum/Oil/Lubricants (POL). You should be experienced in all matters related to the bulk storage of POL products ashore and afloat, delivery systems and treatment systems.

Starting salary will be in the range £26,129 - £36,417 (including £1750 Inner London Weighting).

For further details and an application form (to be returned by 15 November 1991) write to Recruitment & Assessment Services, Alencon Link, Basingstoke, Hants RG21 1JB, or telephone Basingstoke (0256) 468551 (answering service operates outside office hours). **Please quote ref: B/1241.**

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